GUEST EDITORIAL

Evaluations of hospital and/or trauma care systems have greatly influenced care delivery to the seriously injured in the USA. In the early 1980s studies in Orange County, California, reported that preventable deaths were substantially reduced after a trauma center/system of care was established (West et al., 1983; Cales, 1984). Similar reductions in preventable deaths noted in other locations (Cales, 1985) fostered the development of regional systems of care based on criteria established by the American College of Surgeons (Committee on Trauma, 1986). These evaluations were based largely on expert review of autopsy findings for all deaths due to injury (West, 1981; West, 1982). A similar method has been used in the UK (Anderson et al., 1988). Such assessments, however, require recognized experts, are time-consuming, subjective, contingent on the availability and variability of autopsies and associated reports and do not provide a balanced view of care by failing to consider noteworthy survivors among the seriously injured. Similar criticisms have been noted by others (Lancet Editorial, 1988).

Faced with time and resource limitations, researchers and health care providers have sought objective methods for identifying patients (survivors and non-survivors) who are truly worthy of review in institutional and system quality assurance activities. To date, effort has focused on the development of norms for predicting patient in-hospital survival/death and on their use in institutional evaluations and in identifying all patients with ‘unexpected outcomes.’ However, norms for patient disability at discharge from the acute care facility, for lengths of stay in hospital, and in intensive care units and for pre-hospital care are now also being developed (Sacco et al., 1988).

The American College of Surgeons Committee on Trauma (ACSCOT) suggests that both anatomic and physiologic scores are needed to adequately characterize the injured patient for survival/death predictions (ASCOT, 1987). TRISS (Champion et al., 1983) is a composite index developed in 1983 that included then state-of-the-art indices, the Trauma Score (Champion et al., 1981) (physiologic), the Injury Severity Score (ISS) (Baker et al., 1974) (anatomic) and patient age. TRISS has been frequently applied in research and institution and system evaluations. It is the basis for analyses performed in the American College of Surgeons Major Trauma Outcome Study (MTOS). The MTOS database includes demographic, physiologic and outcome data and text descriptions of anatomic injuries for more than 120,000 trauma patients admitted since 1982 by more than 140 hospitals. Study participants are primarily North American trauma centers. Mathematical equations (logistic function ‘norms’), based on MTOS patient data, relate TRISS values to survival probability (Ps) for adult patients with blunt or penetrating injuries and for paediatric patients (Boyd et al., 1987). Each institution’s survival rate is compared with the severity adjusted rate predicted using TRISS norms. Patients with ‘unexpected outcomes’ (survivors whose estimated survival probabilities are less than 0.5 and non-survivors whose Ps exceeds 0.5) are identified and suggested as worthy of peer review. Recent reviews of such patients by directors of MTOS sites have reaffirmed the importance, for example, of prompt and effective prophylaxis for deep venous thrombosis.
Audits of 'unexpected outcomes' have also suggested limitations of TRISS and its component indices. For example, the Trauma Score did not reliably indicate the severity of some serious head injuries, motivating the development of the Revised Trauma Score (RTS) (Champion et al., 1989). Limitations of the ISS have also been reported (Copes et al., 1988). Work on a revised characterization of anatomic injury severity is underway, supported by a federal grant (Sacco et al., 1988).

Despite its widespread use, TRISS has other flaws. For example, 10% of MTOS patients are excluded from TRISS analyses, most because one or more RTS variables (Glasgow Coma Scale, systolic blood pressure, respiratory rate) had not been assessed or recorded at emergency department admission. Excluded patients have higher average Injury Severity Scores and twice the mortality rate of patients qualifying for analysis. Methods have been developed for identifying excluded patients who are worthy of review (Harviel et al., accepted for publication 1989). But, the exclusion of these patients from institutional evaluations can seriously bias results. Many excluded patients have been intubated during pre-hospital care or at the referring hospital and assessments of best verbal response and unassisted respiratory rate needed for TRISS cannot be obtained. Streamlined scores not requiring those variables are needed and their predictive accuracy for intubated and non-intubated patients should be determined. Some decrease in predictive accuracy may be the cost of outcome predictors that permit the inclusion in evaluations of nearly all patients, including seriously injured intubated patients.

There are other, more insidious complications to trauma patient evaluation, that is patients whose pre-hospital treatment or pre-injury activities render impossible the accurate or meaningful assessment of physiology on emergency department admission. A frequently occurring example is the depression of Glasgow Coma Scale (GCS) caused solely by excessive alcohol, drugs or pre-hospital paralysis. Predictive methods are needed that do not require variables whose true values cannot be determined.

TRISS outcome predictions have been found to be extremely reliable for paediatric injured patients (those less than 15 years of age), which argues against the need for paediatric-specific severity indices (Tepas et al., 1986). However, TRISS may not be so reliable for the elderly, an increasing segment of our society which consumes a disproportionately large share of health care resources including those for trauma care. The importance of factors such as co-morbid conditions or pre-injury functional level to the outcomes of the elderly injured may warrant their inclusion in predictors though they may not be needed for the more prevalent injured young male.

Since 1981, applications of severity scores and associated evaluations have increased in importance. The Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) has announced its intent to include trauma patient outcomes in its accreditation decisions (JCAHO, 1987). Legislation requiring that trauma patient data be reported to accrediting agencies has been enacted in some states (Laws of Pennsylvania Act, 1985). For example, the Pennsylvania Trauma Systems Foundation (PTSF) is a legislatively mandated, private organization responsible for the accreditation and performance review of Pennsylvania's trauma centers. PTSF has established a statewide trauma database and analysis system to which all of Pennsylvania's accredited trauma centres submit data. Several other states also maintain or are initiating such registries.
Because of the widespread use and growing needs for trauma care systems development and evaluation, continued research is necessary. More accurate and reliable characterizations of injury severity and relationships to outcome are evolving and show significant benefits (Copes et al., 1989). For example, TRISS and a developmental method for characterizing injury severity were recently compared. The developmental method provided substantial increases in sensitivity, discrimination between survivors and non-survivors and predictive reliability. We must use the best methods available, be aware of their limitations and continue the search for needed improvements.

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