

## Beware of Comparing International Health Systems, Including Trauma Units

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International health system comparisons are very difficult to perform, and one should be cautious when drawing conclusions from such analysis [1]. Assessment and definition of outcomes in healthcare systems is very complicated, and comparison of outcomes between different countries can be difficult to interpret and sometimes even hazardous. It has been stated that in cross-sectional comparisons there are surprisingly large disparities, sometimes amounting to twofold differences between countries [2]. The problem of defining health outcomes can be dealt with by using two different approaches. In one, macro parameters such as death, for example, are measured. The underlying assumption for this approach is that major categories of health outcomes are affected by multiple causes. The second makes use of much narrower parameters. This approach can be applied only in limited situations in which independence among structure, process and outcomes can be shown [3]. When comparing two epidemiologic data sets – two national registries in our case – inclusion and exclusion criteria as well as other operational definitions should be identical.

In this issue of *IMAJ*, DeKeyser and associates compare epidemiologic injury data, with death as an outcome parameter, between two communities [4]. Trauma registry data for the years 1995–96 in the level I trauma center of Hadassah University Hospital are compared with those of the same period in a level I trauma center in Fairfax County, Virginia, USA. Some of the significant differences between the two systems reported by the authors can be explained by the above mentioned obstacles. Hospital-based trauma units have an inlet of injured patients from the community, and should of course have an outlet to the community, preferably at the first stage, to some form of supportive rehabilitation system, either an inpatient or outpatient setting. Outlet options, insurance coverage and reimbursement methods will influence both the length of stay in the tertiary center and the accessibility to rehabilitation and proper medical follow-up thereafter.

The trauma chain of treatment comprises several phases. The first is the pre-hospital phase, where care is afforded by non-professional bystanders and by professional emergency medical service teams. The hospital phase includes the admitting area, the imaging and laboratory services, the operating rooms, the intensive care unit, and the department to which the patient is transferred. The final phase is discharge, which should include

rehabilitation care. All these components of tertiary prevention should influence the final outcome, as measured by QALY (Quality-Adjusted Life-Years) [5,6]. The trauma system in Israel has traveled a long road to create an appropriate structure and process – by establishing the criteria as well as adopting guidelines offered by the American College of Surgeons with minor necessary modifications [5].

Contradictory results on the efficacy of trauma units around the globe are well established in the medical literature [7–9]. Nicholl and Turner [7] compared outcomes in the form of death rates between the trauma system established in the North West Midland region and in two control regions, all in Britain. In the experiment region there was no significant increase in the total number of patients taken to a level I trauma center when compared to the controls. However, there was an increase in multiple trauma (which the authors defined as those with two or more body regions having an Abbreviated Injury Scale score of  $\geq 3$ ). With different stratifications no significant decline in death rate was found in the experiment region. The authors conclude that the benefits of developing regional trauma units in this specific model are modest. In an editorial to this article, Yates [8] points out that the discrepant results to those obtained in the USA can be partly related to different injury patterns and demographics. He also mentions the limitation of statistical analysis related to low incidence of death following injury.

Examination of another trauma system, this time in Germany [10], shows that integration of a new trauma system was associated with a reduction in mortality from 37% to 22% during 20 years. However, there is no doubt that over such a long period other components, such as medical technology, had changed. Another study in Britain demonstrated a significant reduction in trauma death among patients younger than 25, over a period of 8 years [11].

In the U.S., Bazzoli and colleagues [12] reported an improvement in the process of implementing trauma system components, but noted deficits in certain protocols in some states. They call for the employment of improved measures to evaluate a patient's outcome. In a recent retrospective cohort study [9], mortality and hospital length of stay were studied in 31 level I and II trauma centers. The centers were divided into two groups according to yearly admissions: high volume > 650

admissions and low volume  $\leq$  650 admissions. Six of the centers belonged to the higher volume group of severe trauma with an Injury Severity score  $\geq$  16 patient admittance. This selective group showed favorable survival and length of hospitalization after multivariate analysis of patients' characteristics. Thus the beneficial effects of high volume exposure and experience – important constituents of Level I trauma centers – are pronounced.

In conclusion, there are different accounts in the literature regarding the relationship between mortality and the existence of trauma centers, although most emphasize the contribution of trauma centers to survival. Clearly, comparison between systems, especially those from different countries, is problematic. Trauma care providers in Israel are able to identify certain patients who have benefited from the trauma team approach. In order to measure efficacy on a national level, a well-designed multi-center prospective cohort study of all level I trauma units in Israel should be launched.

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