

Title: FOUR YEAR MORTALITY OF TRAUMA VICTIMS ADMITTED DIRECTLY FROM THE ACCIDENT BY HELICOPTER

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Introduction. Rapid evacuation of patients directly from the scene of a motor vehicle accident (MVA) to a center specializing in trauma is considered an ideal method of preventing the loss of potentially salvageable lives. The four year mortality (1976-1979) at a trauma center was analyzed to determine the causes of failure to resuscitate despite this management.

Results. There were 4,340 admissions to the center, 2,320 (53.4%) were MVA and 1,703 (68.3%) were admitted directly from the scene of a MVA by helicopter (DHA). Of these 1,703 patients, 383 (22.4%) died. Autopsy was performed on 366 (95.6%) by the pathologist at the Medical Examiners Office. From the autopsy and clinical records, the epidemiology of the 383 patients who died was determined. The patients were divided into 4 groups according to duration of survival. Group I were dead on arrival (DOA). Group II died < 24 hours after admission. Group III died < 5 days and Group IV > 5 days from admission. Of the 383, 156 were drivers, 101 passengers, 68 pedestrians, 46 motorcyclists and 12 unknown. 260 (67.9%) were males. Mean age of all patients was 31.9 years. Blood alcohol was measured in 234 and was positive (mean 0.128% ± SD 0.069) in 119 (50.8%). Carbon monoxide measured in 107 patients was normal in all but 2 drivers with levels of 14%. 379 (99%) patients were tracheally intubated by an anesthesiologist and mechanically ventilated and only 84 (21.9%) who died were conscious on admission. There were 115 DOA patients who were either dead or declared dead within 30 minutes of arrival in cardiac arrest after resuscitation had been initiated and was unsuccessful. The primary cause of death in Group I was craniocerebral trauma (CCT) (46.1%). Excluding DOA patients the mortality was 16.9% (268/1588). Of the potentially salvageable patients in Groups II, III and IV, there were 119 who died < 24 hours after admission (Group II). There were 41 Group II deaths in the admitting area 53 in the operating room and 25 in the intensive care unit - recovery room (ICU). The primary causes of death were hemorrhage 53 patients (44%), CCT 47 (39%), C-spine trauma 12, chest injury 6, and 1 myocardial infarction (MI). Fifty-two patients survived > 24 hours but < 5 days (Group III). CCT was the leading primary cause of death in Group III

patients with 38 deaths, then sepsis and respiratory failure three deaths each, and hemorrhage/coagulopathy, MI or multiple trauma (2 each), then burns and fat embolus (1 each). 92 of the 383 patients dying (24%) survived longer than 5 days (Group IV). The primary causes of death in Group IV patients were CCT 42 (45.6%), multiple organ failure (MOF) 18, sepsis 13, respiratory failure 10, and hemorrhage/coagulopathy 4 patients. C-spine injury (3 patients), MI (1) and cerebral hypoxia (1) were the other causes of death. The annual survival of Group IV patients is shown in Table I:

	1976	1977	1978	1979
# Group IV pts.	12	18	35	28
% of total DHA	3.4	4.4	7.8	5.6
Survival (days)	11.7	19.0	24.7	38.3
Overall mortality	22%	20.6%	19.8%	19.9%
# M.D.'s employed	22	18	23	25

TABLE I: Group IV survival duration and admissions mortality and number of physicians employed/year.

Discussion. The analysis of causes of death has important patient management implications. Unconsciousness on admission was the most sensitive indicator of a fatal prognosis and CCT accounting for 47% (180/383) of the deaths was the leading cause of mortality. Management of CCT included tracheal intubation, mechanical hyperventilation, routine intracranial pressure monitoring (ICP), corticosteroids, and in 1979 barbiturate therapy if ICP > 25 mmHg persisted. Aggressive early tracheal intubation resulted in only 13 deaths from respiratory failure. Fat embolus despite a population with multiple fractures was rare. The 17.5% (67/383) incidence of C-spine Fx justifies routine admission C-spine X-ray of MVA victims. The incidence of sepsis renal failure and MOF increased with prolongation of ICU stay. Despite increased staffing and aggressive management with direct helicopter admission and rapid attention to diagnosis and therapy, hemorrhage and CCT are still leading causes of death. Mortality over the 4 years was little changed although survival time before death was prolonged (Table 1). This has medical and economic implications. These results suggest therapy and medical staffing improvements did not alter mortality and that there is a need for universal prognostic indices and population analysis for future evaluation of improvements in therapy.