

*Contemporary Themes***Study of 100 patients injured by London underground trains 1981-6**

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Abstract

One hundred patients who were injured by London underground trains during 1981-6 were studied; 43 of them died. Deliberate self harm was probable in roughly three quarters. Alcohol intoxication was thought to play an important part in a further tenth of cases. Thirteen were psychiatric inpatients at the time of the incident, and a further two had recently been discharged. Early warning of a potential suicide attempt was given during the 24 hours preceding the incident in 15 of the cases. Some of the deaths in the psychiatric patients may have been preventable.

Introduction

Railway injuries and suicides are not new phenomena. The London Transport daily diary of events for the years 1916-20 contains 89 reports of death and serious injury to passengers who fell under trains.¹ Most of the deaths are recorded as suicides. All deep stations that were opened in 1932 were constructed with an invert or "suicide pit" beneath the central rail with the aim of minimising such injuries. Similar pits were added to older existing stations from 1935 onwards. The first mention of this type of injury in a medical publication was in 1936 in the *BMJ* in an article discussing suicide.²

In 1983 I observed an increase in the number of patients who presented to this hospital after being injured on the tracks of the local underground stations, and this trend continued: 1981 two survived, one died; 1982 three, one; 1983 six, one; 1984 one, two; 1985 six, two; 1986 four, six. This was found to reflect a steady

increase in the number of cases for the underground system as a whole (table I).

Between 1981 and 1986 there were 641 cases of injury on the tracks of the underground system involving trains. This total excludes accidents to passengers on board the trains and to those on the platforms. This hospital, the Whittington Hospital, and University College Hospital together admitted 106 of the 641 patients, and this group forms the basis of the study.

TABLE I—Yearly incidence of injuries and deaths, 1973-86, London underground

Year	No killed	No injured	Total No
1973	42	32	74
1974	45	33	78
1975	57	32	89
1976	45	34	79
1977	49	36	85
1978	52	35	87
1979	59	46	105
1980	68	36	104
1981	40	50	90
1982	36	38	74
1983	57	52	109
1984	68	47	115
1985	70	55	125
1986	65	64	129

London underground system^{3,4}

The modern London underground system has 265 miles of track between 276 stations. Many of the peripheral stations lie above ground but most lines in central London have underground stations at an average depth of 24 m. The oldest part of the system dates from 1863 and is still in use as the section of Metropolitan Line between Paddington and Farringdon. This section was built by roofing over an excavated trench by a method known as "cut and cover." The whole Circle Line is of this subsurface type. The first true tube tunnels were constructed from 1890 onwards using tunnelling shields developed by the engineer James Henry Greathead (1844-96). The running

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lines are of 4 ft 8½ in (143 cm) gauge, and this feature is common to the entire system. Two extra rails carry the 630 volts DC traction current, the positive rail lying furthest away from the platform in stations. Eight types of tube train are in current use, the earliest dating from 1938. Each train consists of six to eight sections, each 15 m in length and 25 tonnes (25 500 kg) average weight.

The emergency stopping distance (relevant to this study) for a train that enters a station at 50 km per hour is approximately 120 m. (Calculated from information provided by the Department of Mechanical Engineering, London Transport.)

Methods and results

Information on the 106 patients who were taken to the three hospitals was gathered from the following sources: (i) The British Transport Police. Accurate registers and records are maintained of all cases of injury in compliance with the Railways Regulation Act 1893. These details were used as a key to the sources below. (ii) Accident and emergency department registers and records. (iii) Main hospital medical records. (iv) Coroners' records. Adequate details were obtained for 100 patients. The remaining six were excluded from the analysis because of insufficient information.

Injuries were quantified using the injury severity score. Studies have shown that this score is an accurate predictor of survival when applied to traffic accidents on the road,⁵ and it is considered to be applicable to the assessment of other types of blunt trauma.⁶

Table II gives the age distribution of 93 of the 100 patients. There were no children or patients over age 81. The mean age was 40 and the mode was in the third decade. There were 49 men and 51 women; 35 patients died at the scene of the accident, and 65 reached hospital alive (table III). Of the 57 ultimate survivors, three psychiatric patients later repeated the attempt and one died. One other survivor subsequently committed suicide by jumping from a high building.

There were 17 cases of entrapment in the train mechanisms. The mobile medical team from this hospital attended six such incidents. One patient was certified dead at the scene, and five reached hospital alive, four surviving to leave hospital. Information on the method of extrication was available for 68 patients. Twenty four were fit enough to crawl out from beneath the train with help. In another 38 cases the train was advanced or reversed away, with the patient lying in a safe position; 22 of these patients were alive and were protected and restrained by emergency services personnel while the train was moved. In stations with a pit the method of choice was to lay the patient on the floor of the pit, with two rescuers protecting the head, arms, and legs. In stations without a pit the patient was positioned in the narrow space beneath the platform edge, beside the tracks. In five cases the train was

TABLE II—Age distribution of 93 patients*

Decade	No of patients
0-10	0
11-20	4
21-30	23
31-40	16
41-50	17
51-60	17
61-70	11
71-80	5
81-90	0

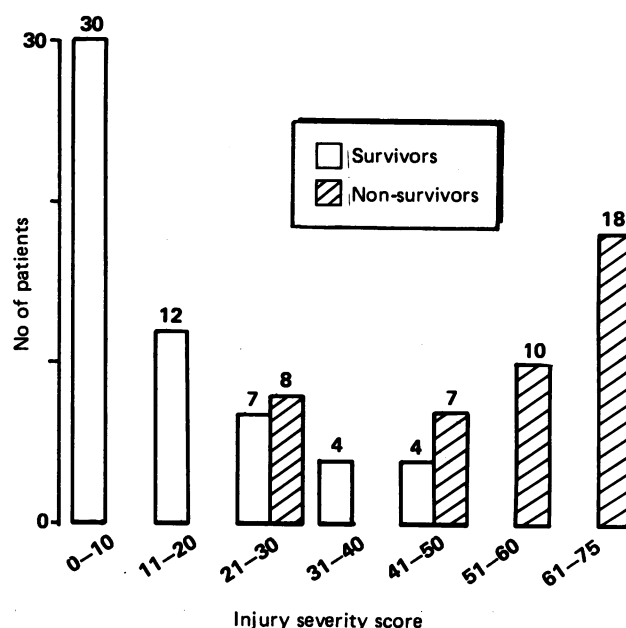
*Exact ages not known for seven who died.

TABLE III—Immediate outcome and admission of 65 patients who arrived at hospital alive

Immediate outcome/admission	No
Admitted to psychiatric unit	23
Admitted to general hospital ward	14
Admitted to observation ward	6
Admitted to intensive care unit	4
Admitted to neurosurgical ward	4
Died in accident and emergency department	4 (<4 h)
Died in operating theatre	2 (<4 h)
Died in general ward	2 (30 days, 6 mth)
Died in intensive care unit	1 (3 days)
Died in neurosurgical unit	1 (<4 h)
Self discharge from accident and emergency department	3
Arrest by police	1

TABLE IV—Injuries according to area of body

Body area	No of survivors	No of non-survivors	Total No (n=194)
Head and neck	17	27	44
Face	7	4	11
Chest	11	23	34
Abdominal and pelvic contents	7	18	25
Limbs and pelvic girdle:	34	33	67
Arm	8	6	
Leg	18	14	
Pelvis	8	13	
External only	13	0	13



Injury severity score for 100 patients.

jacked up by a heavy lifting gang to release a trapped arm or leg, and in one case the train was tilted using an air bag. In another case the patient's upper body was trapped across the centre (negative) rail, and the rail was lowered by breaking the ceramic insulators supporting it.

Table IV lists the injuries sustained by the patients and the figure shows the distribution of injury severity scores, with mortality and survival.

The delay to the underground service, which gives an indirect measurement of entrapment time, ranged from 0 to 106 minutes, with a mean of 34 minutes per incident.

AETIOLOGICAL FACTORS

Nine patients were found to have consumed appreciable amounts of alcohol from clinical examination or from the pathologist's estimation of blood alcohol concentrations. Six patients were visibly drunk before the incident according to eye witnesses. These patients fell from the platform in front of trains as they entered the station. All received multiple injuries but survived. Two were left disabled with leg amputations.

A total of 58 patients had a previous history of inpatient treatment for a psychiatric illness, and 39 had made a previous suicide attempt. Thirty nine had been treated for depression, eight for schizophrenia, two for manic-depressive illness, and two for alcoholism. In seven cases the diagnosis was not available.

At the time of the incident 13 patients were psychiatric inpatients, and another two were killed within 48 hours of discharge from a psychiatric unit. Six inpatients and two former inpatients had been on the same ward, and five of these had been injured in 1985. Fifteen patients had expressed a wish to kill themselves to another person during the 24 hours preceding the incident.

Eye witnesses stated that the patient's action appeared deliberate in about three quarters of the cases. For those who died the coroner's jury returned verdicts of suicide in 21 cases, misadventure in six, and accidental death in six and open verdicts in 10. Railway suicide accounted for 6.8% of all suicide

deaths in the inner north London coroner's district during the period 1971-85.⁷

Six of the 10 underground stations with the highest frequency of incidents were situated within half a mile of a major psychiatric unit. The stations were King's Cross, Mile End, Tooting Bec, Oxford Circus, Hampstead, and Belsize Park.

Discussion

Railway suicides have been investigated in Canada, Denmark, the United States, and Britain, but the studies concentrated on fatal cases and their psychiatric features.⁸⁻¹¹ Johnston *et al* examined the records of the Toronto subway and found that most incidents occurred between 1000 and 1700 hours.⁸ They recommended posting inspectors on the station platforms at peak hours. No similar clustering of incidents around peak times of day was found in the present study. Records were found for 19 survivors, and a high incidence of traumatic amputation was noted.

Lindekilde and Wang, in a study of railway suicide in Denmark, concluded that little more could be done by the railway authorities to prevent incidents and the problem would be better approached by preventive psychiatric treatment.⁹

Guggenheim and Weisman studied 50 cases from the Boston subway and found that most patients who attempted suicide were highly disturbed, with a similar high incidence of previous psychiatric illness.¹⁰ Symonds, investigating the psychiatric aspects of railway fatalities, noted 82 probable suicides in a group of 134 fatalities.¹¹ In the present study the proportion was similar. Comparing the different studies shows that the percentage of patients who selected the railway as their method of suicide is similar (Denmark 3%, Canada 7%, inner north London coroner 6.8%).

None of the above studies investigated survivors in detail. In the present study most of the patients survived. The only patients who died with an injury severity score of less than 40 were those with a single, severe injury—for example, a head injury—who were given

a score of 25. A study of long term morbidity and mortality has not yet been carried out, but it is known that four survivors have attempted suicide again during the study period. Three of these chose the underground train as their method, and one died. The fourth patient jumped from a high building and died. Other survivors have been noted to require repeated and prolonged admission to psychiatric units. The occurrence of five incidents concerning patients from a single ward in 1985 suggests that this method of suicide may be well known among groups of psychiatric patients.

It seems that in the time immediately after discharge from hospital the risk of suicide may be increased. Inpatients in psychiatric hospitals featured strongly in this study, and patients in the community often gave notice of their intentions. For these reasons some of the injuries and deaths may be considered to have been preventable.

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Effect of the 1983 Mental Health Act on the management of psychiatric patients

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Abstract

Two principal objectives of the 1983 Mental Health Act were to decrease the use of emergency orders and to give patients on observation orders the right of appeal. Statistics were collected from the 13 hospitals that admit acute psychiatric patients in the Greater Manchester area, and the figures for 1980-1 were compared with those for 1984-5. Changes in use of the different sections were examined in university units, large psychiatric hospitals, and district general hospital units. The use of emergency orders decreased and the use of treatment orders increased; the use of observation orders remained unchanged. Many more

patients exercised their right of appeal in 1984-5, but the number discharged by tribunals remained small. The nurses' holding power was used infrequently. The different types of hospital are now more concordant in their use of these orders than before the 1983 act.

Introduction

The 1983 Mental Health Act was intended to be a liberalising act, increasing rights of appeal for detained patients and discouraging the overuse of emergency orders. Some of the new provisions in the act were welcomed by all concerned with its use, but others aroused predictions of unworkability.

Section 2 of the act replaces section 25 as a 28 day order for assessment but contains additional powers to enforce treatment if necessary. A major addition to this section is the right of appeal to a mental health review tribunal within 14 days of admission. It was predicted that the threat of a tribunal before there was a chance to assess a patient properly would lead psychiatrists to avoid using

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