

Severe Self-poisoning in Sunderland

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Summary: One hundred and twenty-nine patients (25.5%) out of 505 consecutive cases of self-poisoning admitted to a non-teaching poisoning treatment centre run as part of an acute medical unit are reviewed in detail. All of them were severely poisoned and would possibly have died without admission to hospital. Despite considerable limitations in the medical, nursing, and laboratory facilities available a very low mortality rate was achieved by practising intensive supportive and conservative care, supplemented on occasion by a forced alkaline diuresis.

This paper examines 129 severely self-poisoned patients. These comprised 25.5% of 505 cases of self-poisoning admitted to a district poisoning treatment centre between 1 October 1966 and 31 March 1968, which have been reported elsewhere (Burston, 1969a).

District Poisoning Treatment Centre

After the report of the Standing Medical Advisory Committee (1962) the Royal Infirmary, Sunderland, was established as the District Poisoning Treatment Centre for that area of North-east England. It served a population of about 333,000 persons aged 12 years or more. The centre was part of an 81-bedded acute medical unit admitting some 2,000 patients per annum and was staffed by two maximum part-time consultant physicians, one medical registrar, and two preregistration house officers. All patients were initially admitted to the casualty department situated in the same hospital and staffed by one maximum part-time consultant surgeon, one full-time medical assistant, and three senior house officers.

Ancillary Facilities.—The Area Pathological Laboratory provided a 24-hour service, though from 5 p.m. to 9 a.m. only one technician was available to perform all emergency investigations for the whole area. Between 9 a.m. and 5 p.m. only serum barbiturates, plasma salicylates, and carboxyhaemoglobin could be estimated for the most part of the survey (Table I), though during the last six months a method of estimating plasma salicylate levels became available after the introduction of a simple side-room technique (Burston, 1969b). At no time could accurate estimation of gastric lavage contents be performed. Seventy-six (59%) of the severely self-poisoned cases

TABLE I.—Investigations Available

Investigation	24-hour Service	9 a.m.—5 p.m. Service*
Serum sodium, potassium	+	
Blood urea	+	
Plasma salicylate	++	
Electrocardiography	+	
Radiography	+	
Serum chloride, bicarbonate		+
Serum barbiturate		++
Carboxyhaemoglobin		+
Urine urea, sodium		+

* 9 a.m.—5 p.m. Monday to Friday inclusive; 9 a.m.—1 p.m. Saturday only.
 † Trinder's method (1954) available for first year, Burston's method (1969b) available for last six months of the survey.
 ‡ Barbiturate method used a technique of extracting barbiturate from whole blood into chloroform.

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were admitted between 5 p.m. and 9 a.m., when the laboratory could provide only emergency services. Respiratory function tests were limited to a clinical impression of the patient's respiratory function, reinforced by measurement of the minute volume. Arterial blood gas analysis facilities were not available. Electrocardiographic recordings and monitoring facilities and radiological procedures were available at all times. Electroencephalographic recordings could never be obtained.

The Survey

The 129 patients aged 13 to 84 were admitted to the unit suffering from deliberate severe self-poisoning. All these patients were assigned to one of the following grades of unconsciousness (Matthew *et al.*, 1966):

- Grade 0—Fully conscious.
- Grade 1—Drowsy but responding to verbal command.
- Grade 2—Maximal response to minimal painful stimuli.
- Grade 3—Minimal response to maximal painful stimuli (rubbing the knuckles over the patient's sternum).
- Grade 4—No response to painful stimuli, loss of all reflexes, including the pharyngeal and laryngeal reflexes.

A patient was considered to be severely poisoned when grade 3 or 4 unconscious, with or without the added presence of shock, hypotension, or respiratory embarrassment (Table II). Salicylate poisoning was regarded as severe if the plasma level was greater than 50 mg./100 ml. on admission. All such patients were fully conscious (grade 0). Coal-gas poisoning was regarded as severe if the patient was grade 3 or 4 unconscious on admission or had a carboxyhaemoglobin level of more than 40% on admission.

TABLE II.—Categories of Unconsciousness According to Age and Sex

Age in Years	Grade 3/4 Unconscious		Grade 3/4 Unconscious + Shock, Hypotension, etc.		Salicylate Poisoning	
	Females	Males	Females	Males	Females	Males
12-19	3	1	3	0	8	1
20-34	16	8	5	0	7	1
35-49	12	12	5	2	3	2
50-64	11	7	6	3	2	1
65+	3	0	4	1	2	0
Total	45	28	23	6	22	5

Females 90 (70%), males 39 (30%).

Eleven female patients and 27 males (29.5%) admitted to taking alcohol with their drug overdose. These patients had taken many different types of drugs, 18 (14%) took more than two different drugs, the maximum number consumed by any one patient was six. The drugs consumed by the 129 patients are shown in Table III. Fifteen had taken long-acting barbiturates, usually phenobarbitone, while 27 had taken short- or medium-acting barbiturates of which butobarbitone (Soneryl), pentobarbitone sodium ((Nembutal), and quinalbarbitone plus amylobarbitone sodium (Tuinal) were the most common. Of the other drugs taken methaqualone plus diphenhydramine (Mandrax), amitriptyline (Tryptizol), chlorpromazine (Largactil), and diazepam (Valium) were the most commonly consumed.

TABLE III.—*Drugs Consumed by 129 Patients According to Sex*

Drugs	Female Patients	Male Patients
Salicylates	22	5
Barbiturates	24	16
Antidepressives	9	6
Tranquillizers	20	9
Non-barbiturate hypnotics	16	5
Coal-gas	3	1
Others	6	8
Total	102	50

Lack of facilities associated with lack of correlation between the serum level and degree of unconsciousness resulted in only a 30% estimation of barbiturate levels in those suffering from this form of poisoning. The maximum level obtained was 11.2 mg./100 ml. for long-acting barbiturates and 4.6 mg./100 ml. for short- and medium-acting barbiturates. The maximum plasma salicylate level obtained was 82 mg./100 ml. and 60% carboxyhaemoglobin was the greatest recorded level in coal-gas poisoning.

Management in Casualty Department

Initial investigation and treatment was always started in the casualty department. Gastric lavage was performed only in accordance with the strict criteria of Matthew *et al.* (1966). Patients were subjected to this procedure if they had taken the tablets within four hours of admission; the only exceptions were following self-poisoning with salicylates and Mandrax, when lavage was performed up to 24 hours after ingestion.

Under these conditions 71 patients (55%) were subjected to lavage. In five the procedure had to be abandoned owing to gastric haemorrhage, always associated with either salicylate or Mandrax poisoning. Endotracheal intubation was performed in 22 patients (17%), either to ensure protection against tracheal aspiration during lavage in patients who were grade 4 unconscious or because the patient was suffering from respiratory insufficiency and required artificial respiration.

One patient admitted apparently dead, having taken alcohol and long-acting barbiturates, was resuscitated in the casualty department. She eventually made an uneventful recovery after a forced alkaline diuresis in the ward and was discharged fully recovered.

After gastric lavage and any other appropriate emergency treatment in the casualty department the patient was transferred to the acute medical unit for the remaining stay in hospital until seen by the visiting psychiatric staff and assessed.

Of the 129 patients 39 (30%) were admitted to the casualty department within two hours of taking the overdose, 33 (26%) between two and four hours, 39 (30%) between 4 and 12 hours, and 18 (14%) after more than 12 hours, the longest being 36 hours.

Management in Poisoning Treatment Unit

All patients who were grade 3 or 4, with or without shock, were nursed in a large side-ward until they had recovered. During this time one nurse was detailed to look after that patient alone.

Of the 22 patients initially requiring endotracheal intubation 13 needed assisted respiration for periods varying from six hours to three days. Four patients were admitted with aspiration pneumonia, and members of the department of anaesthetics performed bronchoscopy and bronchial lavage on these cases.

Ten patients had sufficiently prolonged systolic hypotension (less than 80 mm. Hg for more than two hours) to require hypertensive therapy. In eight a satisfactory systolic level of 100 mm. Hg was maintained by intermittent use of metaraminol (Aramine). Two patients required hydrocortisone after raising

the foot of the bed, intravenous fluids, correction of hypothermia, and Aramine had failed to combat the shock present.

The patient's temperature was recorded with a low-reading thermometer at hourly intervals until consistently normal. The lowest recording was 86° F. (30° C.) following poisoning with Largactil, Mandrax, and coal-gas, and the majority of patients presenting with hypothermia were found to have taken one of these two drugs or a combination of both (Burston, 1967).

The basic treatment was intensive nursing care for all patients associated with correction of dehydration, hypoxia, and hypotension. Sixty-one patients (47%) recovered completely after such conservative treatment. In the remaining 68 cases (53%) a forced diuresis was performed by the method described by Maclean (1965) with the modification of substituting frusemide (Lasix) for chlorothiazide as the diuretic.

Twenty-seven patients poisoned with barbiturates were subjected to a forced alkaline diuresis; 15 were subsequently found to have taken long-acting barbiturates and 12 to have taken short- or medium-acting barbiturates. Twenty-seven patients with initial plasma salicylate levels greater than 50 mg./100 ml. (range 52–82 mg./100 ml.) were treated with a forced alkaline diuresis, and a further 10 patients with presenting plasma levels of less than 50 mg./100 ml. who were vomiting and dehydrated were also subjected to this therapy to speed their recovery.

Four patients suffering from Mandrax poisoning were given a forced diuresis before it became clear that this particular drug was not excreted more rapidly by this method (Burston, 1967). This point has subsequently been confirmed by Matthew *et al.* (1968).

Prophylactic antibiotics and analeptic drugs were never used. All grade 3 or 4 unconscious patients were catheterized with the usual precautions.

The duration of unconsciousness in the 129 patients is given in Table IV.

TABLE IV.—*Duration of Unconsciousness According to Sex*

	< 12 hours	12–18 hours	18–24 hours	24–48 hours
No. of female patients ..	64	8	6	7
No. of male patients ..	25	8	2	4

Five female patients were unconscious for periods longer than 48 hours, the maximum being 121 hours.

Complications.—Apart from the five patients who developed gastric haemorrhage during lavage a further two had an increased prothrombin time after Mandrax ingestion. Two patients developed pneumonia after prolonged periods of unconsciousness. Many patients who were electrocardiographically monitored showed transient E.C.G. changes ranging from supraventricular tachycardias to classical myocardial infarction patterns, from pericarditis, incomplete bundle-branch block, to sinus bradycardia. However, no pattern was found to be drug-specific, in spite of suggested reports to the contrary (Burston, 1968).

Discharge from Medical Unit

A high proportion of these patients were transferred to a psychiatric hospital for further treatment following physical recovery. This would be expected in view of the seriousness of the self-poisoning and the lengths to which many of these patients had gone to avoid detection.

Fifty-seven (44%) had inpatient psychiatric treatment; 14 (8%) of these were so mentally disturbed on recovery of consciousness as to require immediate transfer under Section 29 of the Mental Health Act, 1959. Fifteen (12%) were discharged home from the medical unit and followed up at psychiatric out-patient clinics, and the remaining 57 (44%) were discharged directly home to the care of their general practitioners.

Past History of Mental Illness

Fifty-three patients (41%) had a past history of psychiatric illness and 11 had an associated family history. Nine patients had taken their overdose within one month of discharge from a psychiatric unit. Forty (31%) had at least one self-poisoning episode in their past history, the most being six attempts by one male patient. During the 18 months of the survey six patients were admitted on more than one occasion.

Transfer to Regional Poisoning Treatment Centre

The renal unit at the Royal Victoria Infirmary, Newcastle upon Tyne, is the regional centre to which severely self-poisoned patients may be transferred if thought to need haemodialysis. During this survey only one such patient was transferred following self-poisoning with Largactil, Mandrax, and coal-gas, with a view to having haemodialysis. This procedure was considered unnecessary, and after a period of five days' unconsciousness artificial respiration, tracheostomy associated with pneumonia, and five transient cardiac arrests she eventually recovered consciousness. She was found to have a bizarre polyneuropathy thought to be associated with prolonged forced diuresis. The neuropathy resolved, and she was finally discharged to a psychiatric unit from the medical wards 49 days after admission.

Death from Self-poisoning

One patient, a man aged 70, died. He was admitted 36 hours after consuming 12 Mandrax tablets and 12 100-mg. Largactil tablets. Previous to admission he had been kept under observation at home by his general practitioner. On arrival at hospital his rectal temperature was 94.8° F. (34.9° C.) and he was grade 4 unconscious with hypertonia, hyperreflexia, myoclonus, extensor plantar reflexes, and hypotension. He had an aspiration pneumonia and bedsores over the sacrum, trochanters, and elbows. He also had chronic bronchitis and chronic pyelonephritis, and a suprapubic catheter in situ. He had threatened suicide on numerous occasions in the past and had received psychiatric treatment. Following intensive supportive and nursing care he eventually recovered consciousness after 90 hours, only to die 24 hours later from bronchopneumonia.

Discussion

The number of self-poisoned patients admitted to various poisoning treatment centres throughout the country continues to increase. Between 1962 and 1965 this increase was 63% in Oxford (Evans, 1967) and between 1962 and 1967 was 235% in Sunderland. All evidence available suggests that self-poisoning will continue to increase and with it the number of patients whose overdoses cause serious problems of management. Such an increase will further burden an often already strained medical, nursing, and laboratory situation, especially in non-teaching hospitals. Most recent reports of the management of self-poisoning have come from teaching hospital centres—Matthew and Lawson (1966) at Edinburgh; Evans (1967) at Oxford; Graham and Hitchens (1967) at Cardiff; Linton *et al.* (1967) at Glasgow; Mawer and Lee (1968) at Manchester—where all facilities are much greater than in non-teaching hospitals.

The average mortality following self-poisoning may be taken to be 2.1% in teaching hospitals (*British Medical Journal*, 1967), and Locket (1967) suggested that a mortality of about 1% for barbiturate poisoning and 3.5% following aspirin overdose is reasonable.

The mortality rate following self-poisoning in Sunderland in 18 consecutive months was 0.2%, one death in 505 consecutive admissions. This one death in the 129 severely self-poisoned

patients (25.5% of the total) gives a mortality of 0.77% for this group.

These figures are among the lowest recorded in the British medical literature and show that a very high recovery rate may be achieved by treating severely poisoned patients conservatively, modifying such regimens on occasion by the additional use of a forced alkaline diuresis.

Forced diuresis is generally accepted as being of little use in the management of patients suffering from short- or medium-acting barbiturate poisoning, and some criticism may be forthcoming for its use in Sunderland. However, it is inevitable that until there is some totally reliable, easy side-room technique for identifying and estimating serum barbiturates a certain number of patients admitted to non-teaching hospitals with limited laboratory facilities may be subjected to a diuresis which, at least in Sunderland, if performed unnecessarily by more sophisticated criteria, failed to do the patient any harm.

Curry's (1964) method of estimating serum barbiturates is too complicated to perform as a side-room technique (P. Trinder, personal communication, 1968), though it has its uses in the laboratory. Clow and Smith (1967), using a modified form of Curry's method, have produced a side-room technique for estimating serum barbiturates which will give a rough estimation of the level (accurate ± 0.5 mg./100 ml. in 58%) even in the presence of drug mixtures. This method does not, however, seem to be the complete answer.

Some measure of the success of the form of treatment practised in Sunderland may be observed from study of the suicide figures issued recently (*Practitioner*, 1968) (Table V).

TABLE V.—*Death Rates from Suicide per Million Population*

County Borough	1963	1964	1965	1966	1967
Sunderland	100	111	100	86	46
Cardiff	127	111	96	127	121
Manchester	108	116	116	99	107
Newcastle upon Tyne ..	140	165	97	138	143
Greater London	157	140	139	125	122

Of 20 of the largest county boroughs and cities in England and Wales, Sunderland shows by far the greatest decrease in suicides during this period, particularly in 1967, which formed the major part of this survey.

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