Hypertension, renal disease, and heart failure

Having stressed the communities without hypertension, let me again emphasize that most urban or periurban tropical communities show blood pressure patterns similar to those seen in the United Kingdom or in North America and have similar or greater frequencies of individuals with "high blood pressure." In most tropical clinics the majority of subjects seen with raised blood pressures are classified as essential hypertension, particularly those over 40 years of age. A few cases are associated with underlying renal disease, but it is this group of cases that produces most of the severe hypertension problems admitted to hospital. Thus impressions gained from hospital admission studies tend to overemphasize the contribution of renal disease to the community pattern of blood pressure.

A recent necropsy study from Uganda gives some perspective on the problem.⁵³ Over a three-year period some 3,000 necropsies were carried out on patients who had died in the hospital; only 84 cases were finally diagnosed at necropsy as hypertensive heart disease, and these fell into four main groups (see Fig. 2).

Group 1.—Essential hypertension (25 cases). Most of these were elderly men with cerebrovascular disease as the commonest single cause of death.

FIG. 2—Hypertensive heart disease at necropsy 1965-7 in Kampala, Uganda (Hutt and Coles⁵³).

Group 2.—Hypertension associated with glomerulonephritis (24 cases). There were equal numbers of males and females, although males outnumbered females in hospital admission (2 : 1) and at necropsy (2.5 : 1). Seventeen of the 24 patients were under 40 years of age and 11 were below 20 years of age.

Group 3.—Pyelonephritis (19 cases). All of these were males, and 10 had urethral stricture. Gonorrhoea and subsequent urethral stricture are very common tropical problems.^{54 55}

Group 4.—Hypertension of uncertain origin (11 cases). Nine of these were females, average age 26 years. In all cases there was a mild proliferative glomerular lesion, and in six cases there was pathological evidence of malignant hypertension.

Glomerulonephritis was thus present in 42% of the subjects in this study, accounting for nearly all cases of hypertensive heart disease at necropsy under the age of 30 years. The importance of glomerulonephritis in patients admitted to tropical hospitals is further emphasized by a clinical study in Uganda of African women found to have severe hypertension in pregnancy.⁵⁶ Eleven of these 15 women (average age 22 years) showed proliferative glomerulonephritis. This study emphasizes the importance of primary renal disease and in particular glomerulonephritis as a cause of severe hypertension in young patients in hospital in the tropics.

Let me summarize the situation regarding blood pressure and hypertension in the tropics.

(1) Chronic renal disease, particularly glomerulonephritis, is an important cause of severe and fatal hypertension in young people admitted to hospital in many tropical countries. The cause is unknown, though malaria and the streptococcus have each been considered as important factors.

(2) The majority of tropical communities have blood pressure patterns similar to those seen in the economically advanced countries of the world and a similar prevalence of hypertension. Most hypertension occurs over the age of 40 years, and the contribution of chronic renal disease to the prevalence of hypertension above this age is known to be negligible.

(3) A few isolated communities remain in whom blood pressure does not rise with age and in whom essential hypertension is absent. These communities are of considerable importance because it may no longer be possible to answer the basic question "Why does blood pressure rise with age?" in those countries where the phenomenon is so widespread as to be regarded as normal.

The conclusion of these lectures will appear in next week's issue, together with a list of references.

Profile of an Accident Flying Squad

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Summary

An analysis of 184 accident flying squad calls and of 280 patients injured in road accidents and treated by a flying squad based on an accident department inclusive from 1967 to 1971 has shown that such a service can provide an efficient system without disrupting the routine work of the hospital.

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Introduction

Since March 1955 Derby and the surrounding country have been served by an accident flying squad operating from Derbyshire Royal Infirmary casualty department.¹ The team, consisting of a senior casualty surgeon, an anaesthetist, and a trained nurse, travels to any accident victim about whom the already attending emergency services (police, ambulance or fire personnel, or general practitioner) are worried. The call-out originates from one of these groups and is relayed direct to the casualty department. Travel obviously has to be very rapid (and safe), and two police squad cars are used to achieve this.

The equipment (used for no other purpose) is designed to fit into the boots of these cars and consists of all the equipment necessary to treat any surgical, anaesthetic, or resuscitative

emergency which might arise. The service aims to supply an experienced accident team which can be mobilized rapidly, can travel rapidly, and is equipped to do the minimum necessary "in the field" before transporting the patient back to hospital. The system now is well established, works very smoothly, and, in our opinion, reduces both mortality and morbidity and well justifies the time, money, and effort which it demands.

This paper analyses the calls received, the action taken, and the patients treated during the years 1967-71 inclusive.

Analysis of Calls

Mobilization and Duration.—Since two police vehicles are used the mobilization time is divided. During 1971 the first vehicle, carrying the team and immediately needed equipment, averaged just under four minutes from receipt of the call to mobilization. The average time for the second car (carrying late or extra team members and the remainder of the equipment) was six minutes. The duration of calls is measured from the time of leaving the department to the time of return. During 1971 this varied from 10 minutes to 140 minutes, the former being a call with subsequent cancellation, and the latter being a road traffic accident in which after treatment and release of the trapped driver he was taken to a casualty department nearer to the scene of the accident. Of the 79 calls received during 1971, however, 69 (88%) lasted less than an hour, the average time being 44 minutes. The efficiency of the casualty department is not greatly affected by the team members' absence, and the slight decrease in efficiency that does occur is more than balanced by the speedier transfer of the patient to his final destination, most of the initial resuscitation having been performed before his admission to the department.

Number of Calls.—The number of calls increased dramatically during 1971 compared with 1970—79 and 46 respectively (Fig. 1). This was probably due to a combination of factors—an increase

FIG. 1—Yearly number of calls received by accident flying squad.

in the number of high velocity road traffic accidents, and an increasing awareness by the emergency services of the function of the flying squad. The team members are constantly advising the services of the part they can play, and as a result relationships with the emergency services are excellent and could not be improved. No one is ever criticized for a call which later proves to have been unnecessary, but they are occasionally reminded of the service if in one's opinion the squad should have been but was not called to a seriously injured patient. This, of course, leads to a number of unnecessary calls, though at present these amount to only some 10% of the total. In addition the number of aborted calls is increasing slowly. These signify early alert of the flying squad but subsequent realization that they were not required, either because the patient was dead or because he was not as seriously injured as originally appeared.

Location of Call.—Since the area served by the flying squad

stretches up to 30 miles (48 km) in some directions call-out is not limited to trapped patients. The team often travels to meet seriously injured patients in ambulances, and can thus make the 40-minute journey less hazardous. The furthest distance travelled has been 27 miles (43.5 km) to reach a seriously ill patient, but a high proportion of calls (50%) fall between 5 and 15 miles (8 and 24 km), with about half of the remainder being within a 5-mile radius. The outcome of calls received is shown in Fig. 2.

FIG. 2—Outcome of calls attended by flying squad

Type of Call.—The calls have been divided into four main groups—pit accidents, industrial (works) accidents, road traffic accidents, and miscellaneous (including domestic, alerts to the local airport, etc.). All the local pits have now closed, but at the inception of the squad they constituted a large proportion of the calls (Fig. 3). All the other groups are increasing, but none more so than the road traffic accidents, which have registered a fivefold increase in the past four years.

FIG. 3—Frequency of the four main types of call.

Seasonal Distribution of Calls.—Since road traffic accidents account for about 65% of all flying squad calls it seems reasonable for the total calls to be directly related to high-risk periods on the roads—that is, the winter months (Fig. 4). In fact, when the type of accident is related to the time of year the weather

FIG. 4—Seasonal distribution of all calls since 1967.

FIG. 5—Seasonal distribution of the four main types of call over a year.

factor is well demonstrated (Fig. 5), the road traffic accident total being the only one with a significant seasonal variation. This also means that the team members are often working in most adverse weather conditions and therefore have to be clothed accordingly.

Time of Day.—When calls are broken down into the period in which they originate the surprising fact that the total calls reach a peak in the morning is found. In fact, all groups of accident reach a peak during this time, though road traffic accidents do present a higher peak around midnight. This latter group of road traffic accidents are often the most severe, since they usually involve multiple drunken patients.

TABLE I—Timing of Calls throughout the Day (Data for 1967-71)

Time	Road Accidents	Works	Miscellaneous	Total
00.01-04.00 hours ..	16	1	0	17
04.01-08.00 hours ..	8	1	1	10
08.01-12.00 hours ..	26	11	12	49
12.01-16.00 hours ..	22	10	9	41
16.01-20.00 hours ..	19	5	6	30
20.01-24.00 hours ..	29	2	6	37
Total	120	30	34	184

Number of Patients per Call.—Most calls involved only one patient, particularly the works, pit, and domestic groups. However, the road traffic accidents did tend to involve more than one patient requiring treatment—for example, 90 calls involved one patient, 26 calls two patients, 16 calls three or four patients, 11 calls 5 to 10 patients, and one call more than 10 patients. Although patients in these accidents tend to have a mixture of major and minor injuries the team has to be able to cope, initially at least, with three or four seriously injured patients. Extra equipment can always be obtained if necessary. The call involving more than 10 patients was to an accident involving a bus. Although the bus contained 37 injured people I have included only the two seriously injured patients in the following patient study.

TABLE III—Parts Injured according to Type of Accident and (in the case of Road Accidents) Type of Vehicle Involved

	Head	Chest	Abdomen	Pelvis	Arm		Leg		Minor	Burns
					One	Both	One	Both		
Car	83	28	8	9	14	3	34	9	22	0
Lorry	4	1	2	3	2	0	8	8	4	0
Motor-cycle	15	1	3	1	3	0	6	2	3	0
Works	8	2	2	0	6	1	7	1	3	1
Pedestrian	5	1	0	1	1	0	2	1	0	0
Total	115	33	15	14	26	4	57	21	32	1

Analysis of Road Traffic Accident Patients

During the years 1967-71 inclusive, 280 patients were treated by the flying squad. Of these, five were under the age of 10, the ages of 14 were not obtained, and in three cases the time of injury could not be checked. These patients are thus excluded from further analysis. Seventy-three per cent of the patients were male. Of the patients with known ages 60% were aged 15-30 years. Since such a large proportion of the patients were young and had previously been fit they were potentially more salvageable than, for example, patients served by a coronary flying squad.

AGES OF PATIENTS RELATED TO TIME OF ACCIDENT

The striking difference in ages according to the time of day that the road accidents occurred is shown by plotting the two extremes graphically (Fig. 6)—namely, the 11-20 and 41-50-year age groups. This difference presumably reflects the social habits of the two groups, carrying the vivid impression that alcohol is a large contributor to the teenagers' peak risk period around midnight. The figures for all ages are given in Table II.

FIG. 6—Correlation of time road accidents occur with two age groups of patients.

TABLE II—Ages of Patients correlated with Time of Day—Road Traffic Accidents Occurred (Data for 1967-71)

Age (Years)	Time of Day (Hours)						Total Patients
	00.01 to 04.00	04.01 to 08.00	08.01 to 12.00	12.01 to 16.00	16.01 to 20.00	20.01 to 24.00	
11-20 ..	22	1	6	14	11	26	80
21-30 ..	19	8	11	13	9	14	74
31-40 ..	1	2	11	5	4	4	27
41-50 ..	3	0	9	11	7	9	39
51-60 ..	1	0	7	5	0	8	21
61-70 ..	1	0	2	4	3	7	17
Total patients	47	11	46	52	34	68	258

INJURIES

The patients' injuries have been subdivided into body areas and related to type of accident and, in the case of road accidents, to the type of vehicle in which the patient was travelling. Head injuries clearly constitute a large proportion of all injuries, especially in car and motor-cycle travellers (Table III). Of all

the patients with head injury 60 had solely a head injury and 61 had head plus other serious injuries. The type of injury is dictated by the vehicle (Table II). Motor-car injuries are made up of head, chest, and limb injuries. In lorry accidents the patient (usually the driver) has lower limb injuries, and the upper body is usually spared. This impression has been so vivid in recent motorway incidents that the team now takes collapsible Thomas splints to any injured lorry drivers. Among motorcyclists and pedestrians head injuries predominate, and occasionally limb injuries occur. Works accidents (apart from miners with head injuries) usually involve one patient with one limb trapped in machinery, and this group is the one which normally requires true surgical intervention—for example, amputation.

TREATMENT AT SCENE

The flying squad aims to provide rapid, essential medical care at the scene of an accident. Obviously the ideal situation in which to perform surgery or to induce anaesthesia or both is in properly equipped hospital surroundings and not in a hostile environment. There are, however, certain therapeutic measures which must or should be instituted immediately—for example, efficient analgesia, blood volume replacement, tapping tension pneumothoraces, intubation and ventilation, and, rarely, general anaesthesia to allow surgery for otherwise impossible release of a victim (Table IV).

TABLE IV—Measures Instituted at Scene of Accident

Treatment	No. of Occasions	Treatment	No. of Occasions
Intravenous analgesia	59	General anaesthesia for splintage ..	9
Intramuscular analgesia	3	Intubation	24
Drip	104	Ventilation	15
General anaesthesia for release ..	4	Sedation	2

“Anti-shock” measures are obviously the most common treatment required. Our intravenous therapy initially consists of plasma and dextran 70, with blood being obtainable if required. Although a selection of powerful analgesics is taken, our normal routine initial analgesia is pentazocine (Fortral) 60 mg intravenously. We find it efficient, rapidly acting, and relatively free of side effects, its duration of action if given intravenously being about an hour. Thus it does not obscure the clinical picture at subsequent examination by neurosurgeon or general surgeon.

Induction for general anaesthesia is implemented with a short-acting non-barbiturate such as propanidid (Epontol) or methohexitone sodium (Brietal Sodium). If necessary the anaesthetic can then be continued in routine fashion with oxygen, nitrous oxide, and halothane delivered by our portable miniature anaesthetic machine. There is no place in the equipment of the flying squad for Entonox, since they already have a more adaptable form of gas mixing. I am sure, however, that it is of great value in paramedical hands. It is interesting to note that of the 13 patients given general anaesthesia under most unsuitable circumstances (Table IV) only one died, the patient being an elderly woman with severe multiple injuries.

Of the 24 patients intubated 11 died, these including five who were probably already dead but in whom resuscitation was attempted. Of the 15 patients given ventilation on the way to hospital, surprisingly only seven died, these again including a few hopeless cases.

MORTALITY

Of the 280 patients treated by the flying squad 73 died. These are divided in Table V into deaths before arrival of the flying squad, during attendance of the squad (including time spent in the casualty department), and in hospital after admission.

Only three patients died during attendance of the flying squad, and these were among 37 patients with severe multiple injuries. (My definition of severe multiple injuries is where three or more parts of the body are severely injured.) It is

TABLE V—Time of the 73 Deaths

Type of accident	Pedestrian	Car	Lorry	Motor-cycle	Works	Miscellaneous	Total
Before arrival of squad	3	26	4	3	6	6	48
During attendance of squad	0	2	0	1	0	0	3
In hospital	2	10	1	2	2	5	22
Total	5	38	5	6	8	11	73

TABLE VI—Survival among Patients admitted to Hospital

	No. of Patients	No. of Deaths
Intensive care unit	43	10 (23%)
Trauma ward	156	7 (4.5%)
Discharged	30	0

TABLE VII—Injured Parts of Patients who Died in Hospital

	Head	Chest	Abdomen	Pelvis	Arm		Leg		Minor	Burns
					One	Both	One	Both		
No. of patients	12	8	7	4	1	2	2	4	0	1

doubtful if anything can be done for the patients dying before arrival of the squad, but the figure of only 22 (11%) deaths out of 199 viable patients seems a very reasonable one, since this does not include routine road traffic cases. (The Heidelberg Clinic reports a mortality of about 5% of all road traffic accident cases admitted.²)

The figures for deaths in hospital confirm that if the patients' injuries are serious enough to merit admission to any intensive care unit then the chance of survival is greatly diminished (Table VI). Analysis of the injuries of patients dying in hospital (Table VII) shows that the most common injuries leading to death are head, chest, and abdominal injuries (Gogler quoted head injury as a cause of death in 70.2% of his patients)³.

Discussion

There have been many attempts to provide an efficient system which would enable doctors to attend at the scene of a serious accident. Complete mobile “hospitals on wheels” have been abandoned because they are too slow in mobilization. Many groups of general practitioners have joined together and which ever is nearest to an emergency scene is mobilized to that scene. This usually has the advantage of rapid travel but suffers greatly through lack of equipment and finance and the necessary continuing experience in the use of such equipment. It is unreasonable to expect any doctor to intubate someone lying on a dark, wet road when he has not intubated a patient for perhaps several years. The compromise answer surely lies in flying squads based on the major accident centres, which can be financed by the hospital and can use trained casualty staff to whom emergencies are routine.

Apart from a well-equipped team, speed of mobilization and speed of travel are essential. There is no point in a patient remaining at the scene if he can be safely transported to hospital in a shorter time than it takes for the team to reach him.

The figures show an increasing demand for such a service and also prove that senior staff must always be readily available, although they need not necessarily be within the hospital. It is impossible to justify a flying squad's existence statistically in terms of mortality or morbidity. There are a few cases which one can state categorically would have had a fatal outcome³ but for the flying squad's attendance, but these are rare. However, the clinical impression of anyone who travels to the scene or receives the patients in hospital is that these patients benefit greatly from appropriate early treatment.

References

- Collins, J., *British Medical Journal*, 1966, 2, 578.
- Gogler, E., *Unfallverletzungen im Strassenverkehr*. Basle, Geigy, 1962.
- Little, K., *British Medical Journal*, 1971, 2, 772.