The Mobile Medical Squad

SOUTH AFRICA'S FIRST PROFESSIONAL MOBILE ACCIDENT UNIT

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SUMMARY

South Africa's first professional mobile accident unit came into operation on 14 February 1973. It is based on the system described by Snook in England in 1972, with minor modifications dictated by local factors. The specific organisation, methods of operation and problems attached to our scheme, are discussed.

S. Afr. Med. J., **48**, 1915 (1974).

Mobile accident units are not a new concept and operate in various forms in many countries. They have varied from sophisticated operating theatres on wheels[1] to simpler schemes where general practitioners operate from their private cars.[2] These schemes all have merit but they also have their weak points, and in deciding on a system best suited to us, we had to take local conditions into account. The introduction of this unit represents a single aspect of improved patient care in the pre-hospital phase, and the total planning and implementation of improvements in this field will be discussed elsewhere. From the outset it was decided that the unit would have three roles: (*a*) to provide a service, (*b*) to serve as a pilot scheme for future projects, and (*c*) to evaluate emergency equipment for possible later use on a wider scale by our ambulance services.

Geographical Area of Operations

The area covered by the squad coincides with that served by the Cape Peninsula Local Authorities ambulance service. This is a land area of almost 2 000 km² and supports a population in excess of one million persons. The area is made up of eleven municipalities and a large divisional council area, of which eight municipalities and the divisional council have their own fire service. This has posed many problems regarding communication, which will be discussed later. Topographically the area varies from mountainous to large areas of flat ground, susceptible to fog from the sea which borders the area on two sides. Within this territory are contained a metropolitan area with fairly densely populated suburbs, and a more sparsely populated semirural periphery. The region is served by a comprehensive ground level railway system, a well-developed urban and peri-urban motorway network, as well as a large harbour and civilian airport. In addition there are a number of smaller fishing harbours and a smaller airfield in a densely populated area.

It was not originally intended to cover this whole area in view of its size, but as there was no alternative service available, it was decided to extend our system until such time as an alternative arrangement could be made. During the past year we successfully handled many calls in this large area, perhaps due to the excellent motorway system which permits easy access to virtually all points.

Ambulance Service

As mentioned, the whole area is served by a single ambulance service operating from a central station and ten satellite stations. With this system certainly all the important areas are within ten minutes' travelling time of the nearest station. All ambulances are equipped with manual resuscitators, foot suction apparatus, as well as the normal first aid items such as splints, pressure bandages, etc. They are currently being fitted out with spine boards, piped oxygen and Entonox gas, and additional items are constantly considered. In addition, they all carry full intravenous sets for the use of doctors when necessary.

Hospitals

All casualty-receiving hospitals are the responsibility of the Provincial Administration, and at present there are 8 of them scattered throughout the area, so that most cases are no more than 10 minutes away from the nearest hospital.

Motor Accidents

In the area under consideration more than 50% of road accidents involve pedestrians. It has been my experience that expert medical attendance at all motor accidents was unnecessary in the vast majority of cases, since the handling of them was quite within the capabilities of well-trained and -equipped ambulance personnel, particularly with the hospitals so close at hand. This is in accord with experience elsewhere.[3,4] In view of this, efforts are constantly being made to improve the training of ambulance personnel as well as the equipment available to them.

With the above-mentioned facts in mind it was decided that the mobile unit would not attend all accidents, but work on the doctor-where-required basis. We did, how-

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ever, attend all cases where there was an inevitable delay in the removal of the patient to a hospital, such as when a person was trapped or involved in a time-consuming and difficult rescue situation. This includes all forms of accident, on or off the road. In addition to these specific situations, we are always available at the discretion of the ambulance officer. In cases of mass casualties our area of operation is considerably wider and no call is ever refused.

In all situations where there is a time lag before the patient can be removed to hospital, skilled medical help is considered essential. The treatment of complicated injuries over a prolonged period is generally beyond the capabilities of the average ambulanceman, and a simple injury with a good prognosis may prove fatal if relatively simple medical treatment such as intravenous therapy is not instituted when needed.

The System in Use

The system is based on that described by Snook[6] in Bath, England. Briefly this means that a doctor is on duty at any particular time during the 24-hour day. He travels alone to the scene of an accident in a fully-equipped car in radio communication with the accident scene, and is not personally responsible for the actual transport of the patient. Where necessary he accompanies the patient in the ambulance with such equipment as he may require. This particular scheme was adopted for the following reasons:

1. Because of the basic simplicity of the scheme, the service can be initiated without the delay that would be involved in equipping special units or training special staff.
2. The amount of work anticipated did not justify the formation of a special team for this purpose only. The delays involved in mobilising a team of people, some usually involved in other tasks, led to the conclusion that a one-man operation would be more efficient.
3. It was felt undesirable that the normal ambulance personnel should be displaced at the scene of an accident by a special squad. As in the North Riding[3] scheme, it was found that involvement with the doctor at the scene has led to excellent liaison and contributes to the training of the ambulance service.
4. With a view to the possible extension of the service to other centres it was considered necessary that costs should be kept within the reach of smaller hospitals. Similarly, the scheme should remain simple in concept to encourage others to imitate, as indeed we have imitated, the Bath squad.

OPERATIONAL DETAILS

In view of certain modifications to the original scheme and problems of a local nature, certain features of our operation will be discussed.

Staff

All members of the team are doctors working on a voluntary basis, being registrars or consultants on the full-time staff of the hospital, doing duty when they have no other hospital obligations. All are experienced in treating traumatised patients and are presently actively engaged in clinical medicine, although not necessarily traumatic work, being drawn mainly from the departments of surgery, orthopaedics and internal medicine. It is a tribute to these doctors that the service can be maintained on a 24-hour basis every day.

The use of volunteer staff largely contributes to the success of the scheme if one has enthusiastic members. Unfortunately, the number of doctors who are emergency-minded is few, and problems are experienced in this regard.

Communications

This is one of the most important, and certainly the most difficult, aspect of our service. Calls are not invited from the general public, although this has happened on two occasions, and we have answered them, since no call is refused. All our calls come from the police, fire or ambulance departments, and in certain cases, the traffic police. This involves some 14 different authorities all operating on their own radio frequencies, making radio intercommunication extremely difficult. In view of this, we have been forced to make use of a commercial radio set-up which all authorities can contact by dialling a single number. We are in turn contacted by a uni-directional pocket radio and directed to the patient by way of the address given and a map reference. This system has proved most unsatisfactory due to the delays involved, and in spite of a number of short-cuts which have been devised, it remains unsatisfactory because of the human element involved. It is also obviously disadvantageous not being able to communicate from our vehicle to the scene of the accident. In view of radio unreliability it has been necessary to instruct the ambulance personnel to proceed straight to hospital, where the patient is released from the accident situation before our arrival. This has resulted in a number of cases being removed from the scene of the accident and immediate medical assistance seconds before the arrival of the unit.

To obviate this most undesirable situation, two remedies are envisaged. A direct link-up to the ambulance radio frequencies is presently being installed in the vehicle, which will allow us to talk directly to the ambulance or the accident scene and give advice *en route*. The other advantage of this link-up is to obviate the necessity for time-consuming map references, as we can then be 'talked-in' to the accident scene. The ambulance service has been chosen, since their network covers our entire area and there is invariably an ambulance *en route* to the same incident.

The second solution is a long-term plan whereby all the services can be contacted via a common radio frequency, as in Toronto, Canada.

Equipment

A detailed list of equipment is given in the Appendix, but a brief résumé is also given relating to certain of the

items carried. As this is a pilot unit, the latest equipment is used as far as possible and, depending on results, guidance given to ambulance departments regarding the value or otherwise of items particularly useful to them. The equipment is still being expanded, having originated from stock items and donations from various manufacturers.

The Vehicle

This is at present a fast saloon car with a manual gearbox, fitted with a red rotary beacon light and three-tone pneumatic klaxon. This vehicle has the disadvantage that the long spine board has to be carried over the front seat, and although it is not so planned, even in an emergency it is not possible to convey a patient.

This vehicle is being replaced by an automatic open ranch-wagon type, which will be fitted with a custom-built body. The automatic feature is necessary when using the radio while travelling, and the custom-built body will allow us to carry a patient, should it be really necessary. This vehicle will be discussed elsewhere.

Loose Equipment

It has been a basic principle that all equipment should be completely portable at all times. The basic pack containing all life-saving apparatus can be carried on the back, leaving the operator's hands free during a difficult rescue situation. The complete portability of equipment is essential for speedy transfer to other transport when necessary, such as off-road vehicles, helicopters, etc. The pack in use was developed at the hospital in co-operation with the central hospital engineer's department. All equipment is kept as simple as possible to avoid failure, and all apparatus is fully compatible to avoid confusion and delay.

Comment on Individual Items

Entonox: This analgesic gas is used in preference to morphine and pethidine, because of the undesirable side-effects of these two latter drugs, particularly in emergency situations. However, these drugs and also pentazocine are available.

Tauranga Thomas rescue splint: Our unit was the first to use this splint in the Cape Province and it has proved most successful.[6]

Oxygen is administered to all patients with head injuries as soon as possible at the site of the accident.

Cardiobeep: A miniature monitor of the QRS-complex, powered by a transistor radio battery and measuring about 15 × 8 × 2 cm is found ideal for observing patients while procedures are being carried out and when auscultation of the heartbeat, in the presence of an impalpable pulse, is either impossible or very difficult due to noise or while being otherwise occupied. The electrodes are extremely simple and simply fit dry into the axillae.

Other items listed in the Appendix require no further explanation. In addition to this equipment, 4 packs with extra equipment for a disaster situation are kept easily accessible at the hospital, and transport is available for this equipment when required. Items are constantly being improved and renewed.

Call Procedure

On receipt of a call the doctor on duty proceeds directly to the scene of the accident where, in conjunction with ambulance and fire personnel, the patient is attended to. If necessary, the doctor accompanies the patient in the ambulance with such equipment as he needs to the nearest hospital. The accident vehicle is removed either by the police or by ambulance personnel.

Records are kept of all calls, but an efficient system of follow-up is not yet available, due mainly to the large number of receiving hospitals involved.

DISCUSSION

In the first year of operation 58 calls of a varying nature were received. However, I do not propose to discuss details of all cases at this stage, since there were too many variable factors to make any of the statistics significant. These include the newness of the scheme to our liaison services, teething problems with the radio communications, the introduction of petrol rationing and its subsequent effect on road accident figures, as well as the reduction in the permissible blood alcohol level for drivers.

In spite of these sometimes adverse factors, however, the unit has exceeded our original expectations. We reached the majority of cases in time to be of assistance, and no patient has been trapped for longer than 20 minutes without expert medical assistance. Figures regarding the final results are not available, but we feel that we have materially improved the prognosis in a considerable number of cases, as illustrated briefly by the following two examples:

Case 1

The patient had slipped on rocks near the sea some 40 m below the road. He lay exposed overnight, and was discovered some 18 hours after his injury. When the ambulance arrived at the scene he was found to have a closed fracture of the right ankle, a suspected fracture of the lower spine, and was suffering from considerable pain and dehydration. Intravenous therapy was instituted, the fractured ankle immobilised, the patient placed on the spine board and morphine given intramuscularly. He was subsequently moved to the ambulance by the Mountain Club members.

On examination at the hospital the back injury was found to be a compression fracture of thoracic vertebra 12. He left hospital without neurological deficit and perfectly well.

Case 2

The patient, who was driving a combi-type vehicle, collided with a pole on a rainy night. He suffered lacerations of the face and was trapped by both legs, sustaining a

fractured femur and tibia on the left side. His blood pressure could not be recorded and he was stuporous. After intravenous therapy, he regained consciousness and was extremely difficult. He was sedated and Entonox administered during the 90 minutes required for extrication. The fractures were immobilised and the patient removed to hospital with a systolic blood pressure of 110 mmHg. He subsequently made a good recovery.

With the introduction of two-way radio, stabilisation of factors mentioned, and the introduction shortly of a similar service by our neighbouring teaching hospital, statistics relating to our experience may be of more value in the future.

It is already clear that the principles of operation as defined by Snook are well founded. It would not be a viable proposition in our circumstances to indulge in elaborate team-run mobile hospitals, and the scheme should be kept as simple as possible. The running costs of the scheme at present, excluding depreciation of the vehicle, but including its maintenance, are in the region of R60 per month. With an insignificant increase in expense amounting to possibly an additional R10 - R15 per month, the present scheme can handle at least twelve times the number of calls and we will expand soon. On the same basis the scheme is financially viable, even if the calls were to be as few as one per month.

On the administrative side there is a considerable amount of work arising from our system of using a team of doctors, and also from the large number of authorities with which one has to keep in contact.

I should like to thank Dr F. Rabe, Superintendent of Tygerberg Hospital, for his unstinting support, and the members of the squad who have given so much of their free time to maintain this service.

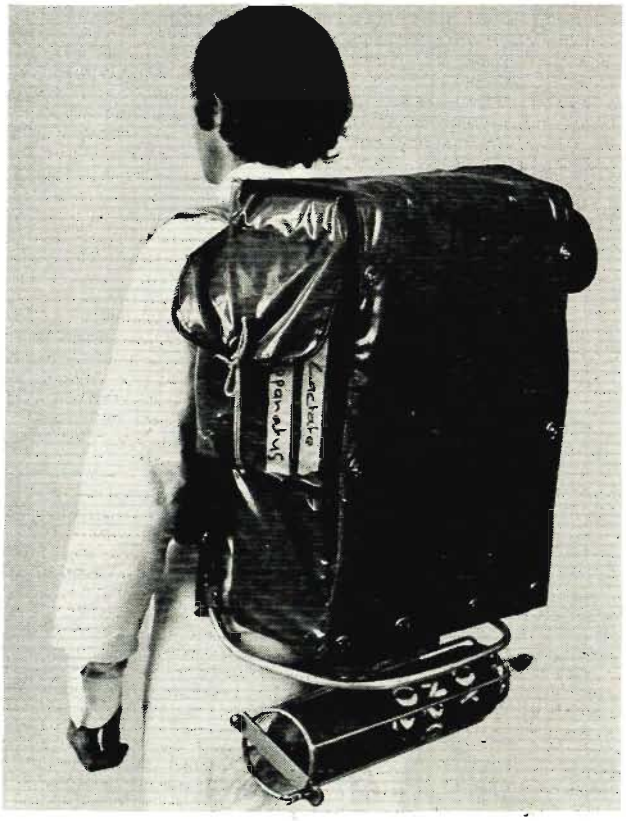

Fig. 1. Basic pack as designed for mobile medical squad.

Fig. 2. Contents of basic pack.

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3. London, P. S. (1972): *Ibid.*, **3**, 225.
4. Snook, R. (1974): Personal communication.
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APPENDIX: EQUIPMENT CARRIED BY MOBILE MEDICAL SQUAD

Basic Pack

Manual respirator (Airbird)
Foot suction pump (Ambu)
Face masks (BOC) Nos 4, 5, 6.
Magill's forceps
Mouth gag
Entonox administration set with alternate disposable mouthpiece and 1 cylinder
Suction catheters (Argyle) No. 10(2), No. 14(2)
Yankauer suction head (Argyle)
Preptic swabs (10)
Blood administration set (Baxter)
Fluid administration set (Baxter) (2)
Tourniquet (Premeta)
Airways (BOC) No. 2, 3, 4
Laryngoscope (Welch Allyn)
Zylocaine jelly
Zylocaine spray
Endotracheal tubes (Portex Blue Line). All sizes cuffed
IV Cannulas (Braunule) No. 2(2), No. 1(4), No. 0,5(2)
(Angiocath) No. 14, 16, 18 (2 each)
Minicannulas (Abbot Butterfly) No. 19, 21, 23 (2 each)

Disposable syringes (Steriject) 10 ml (2), 5 ml (4), 2 ml (2)
Disposable needles (Steriject) multiple
Brook airway
100-mm Corrugated endotracheal connection tube, with fittings
Zinc oxide plaster 50 mm
Kling bandage 100 mm
Gauze squares 100 mm (10)
Haemacel 500 ml (Hoechst)
Ringers lactate 1 000 ml (Baxter)
Sodium bicarbonate 4,2% 50 ml

Stand-by Pack: Top Shelf

Airways (BOC) No. 1, 2, 3, 4 (1 each)
Oxygen catheters — nasal (Damedico) (5)
Elastostretch bandages (Smith & Nephew) 50 mm × 2, 100 mm × 1.
Scissors
Skin traction kits (Smith & Nephew) Adult (1), Child (1)
Suture pack (to own specifications) —
- 4 Mosquito forceps
- 3 Spencer-Wells artery forceps
- 1 Aneurysm needle
- 1 Self-retaining retractor
- 1 Toothed forceps
- 1 Non-toothed forceps
- 1 Small bone cutter
- 1 BP scalpel
- 6 Gauze swabs
- 3 Paper towels

Hibitane in alcohol (120 ml)
Hibitane in water (120 ml)
Dental syringe plus 6 cartridges without adrenalin and 5 disposable needles
Assorted suture material
BP blades
Disposable gloves (Vulco-Sidley)
Kling bandages 75 mm (6)
Surgipads 200 mm × 100 mm (5)
Baby-kit:
- Mucus extractors (2)
- Magill's forceps (small)
- Laryngoscope (Penlon with small blade)
- Resuscitation set for infants (Portex)
- Endotracheal tube (Portex) 2.5 mm
- Suction catheters (Argyle) 8 Fr.
- Two-way airway — baby size
- Airway (BOC) No. 1

Chest drainage:
- Trocar catheters (Argyle) Nos. 16, 20, 28 Fr.
- Heimlich valves (Vycon) (2)
- Drainage bags (Lapro) (2)

Stand-by Pack: Lower Shelf

Large sterile bandage (Curity Multi-Trauma) 750 mm × 250 mm
Blood administration sets (Baxter) (4)
Roehampton burns dressings, 3 sizes
Penlon oxygen gauge with Puritan flowmeter
Ventimask 24%
Haemacel (1 unit) (Hoechst)
Ringers lactate (Baxter) 1 litre
Cardiobeeper (Air-Shields)
Kling bandages
- 75 mm (10)
- 100 mm (4)

Straps — nylon seat type for securing patient to spine boards (3)
Coronary emergency pack:
- Disposable syringes (Steriject) 2 ml (3), 5 ml (2)
- Preptic swabs (10)
- Disposable needles (Steriject) assorted
- Files for ampoules (2)
- Lignocaine 2%
- Aminophylline ampoules (250 mg)
- Atropine ampoules (0,6 mg)
- Digoxin ampoules (0,5 mg)
- Lasix ampoules (20 mg)
- Primperan ampoules (10 mg)
- Decadron shock pack

Auxiliary Pack No. 1 — Dressings

Large sterile dressing (Curity) 750 mm × 250 mm
Surgipads 200 mm × 100 mm (10)
Gauze squares 100 mm × 100 mm (10)
Skin traction kit (Smith & Nephew) adult

Auxiliary Pack No. 2 — Fluid Administration

Fluid administration sets (Baxter) (20)
Needles No. 15
Cannulas (Braunule) No. 0,5(6); No. 1.0(20)
Minicannulas (Abbot Butterfly) No. 19(8); No. 21(8)

Auxiliary Pack No. 3 — Fluids

Ringers lactate (Baxter) 1 000 ml (12)
Haemacel (Hoechst) 500 ml (3)
Plasmalyte B (Baxter) 1 000 ml (1)
Sodium bicarbonate 4,2% (Baxter) 500 ml (1)

Additional Medical Equipment

Oxygen cylinders 4,65 kg (2)
Oxygen piping 7 metres (1), 2 metres (1)
Spine board (long) } to American Orthopaedic Association specifications
Spine board (short) }
Taurange Thomas rescue splint (Afrox)
Kramer wire splints
- 1 metre (4)
- 500 cm (3)

Entonox cylinders (Afrox) portable (2)
Recusiade (Portex)
Woollen blanket
Water for chemical burns
Stethoscope

Other Equipment

Reflector jacket
White coat
Fire extinguisher
Roller towel — disposable
8-Cell flashlight
3-Cell torch
Nylon rope — 12 metres
Road map
Red rotating beacon on roof of car
Mobile Medical Squad illuminated sign on dashboard.