URBAN MOBILE RESUSCITATION: TRAINING AND SERVICE

P. J. F. BASKETT, A. W. DIAMOND AND D. F. COCHRANE

SUMMARY
The establishment of a Mobile Resuscitation Unit based on a District General Hospital is described. The Unit is manned by hospital-trained ambulance men and by an anaesthetist when necessary. The training of the ambulance men, organization of the service and the results are discussed. The authors recommend the establishment of such a Unit in association with an urban district general hospital for the immediate care of all patients who suddenly become seriously ill, regardless of the cause of their illness or accident.

The treatment of patients with acute, life-threatening illness or injury falls into five phases:
1. At the site where the illness or injury occurred.
2. During transport to hospital.
3. In the hospital accident and emergency department.
4. In the operating rooms, intensive care units and hospital wards.
5. The rehabilitation period.

The results achieved by resuscitation teams in hospital have demonstrated the substantial reduction in morbidity and mortality that occurs in response to rapid and efficient resuscitation of patients whose lives are threatened by respiratory or circulatory failure (Smith and Anthonisen, 1965; Marshall, 1966; Sykes and Orr, 1966; Wildsmith, Dennyson and Myers, 1972; Eltringham and Baskett, 1973). It is probable that a significant reduction in mortality and morbidity in patients who are seriously ill and in need of resuscitation can be achieved by the application of resuscitation techniques before the patient reaches hospital. These skills are now well known and the equipment is available and readily portable. Several reports (Pantridge and Geddes, 1967; Götzsche and Lysgaard, 1968; Poulsen and Lysgaard, 1968; Snook, 1969; Binning, 1970; Gearty et al., 1971; Grace, 1971; Barr, 1972; Baskett, 1973; Diamond, 1973) have indicated the value of mobile resuscitation teams, particularly for traumatic accident victims and patients with myocardial infarction.

GEOGRAPHICAL CONSIDERATIONS
The organization of any mobile resuscitation scheme is influenced by geography. Because of the distances involved, the general practitioner schemes are more practical in rural areas. About 800 general practitioners are involved in these schemes, following the example of pioneers such as Dr Kenneth Easton in Catterick, Yorkshire. The schemes are co-ordinated loosely by the Immediate Care Committee of the Medical Commission for Accident Prevention.

In urban and semi-rural areas, however, distances are shorter and the ambulance services are usually available within minutes. The central location of district general hospitals provides a logical base for a mobile resuscitation scheme.

THE HOSPITAL
Frenchay Hospital is a district general hospital with about 600 beds, situated in the north-east of the city of Bristol. It serves a population of 220 000 from a densely populated district to the south and east, and semi-rural and rural areas to the north and west. Nearby is a motorway access point adjacent to interchanges involving the London–South Wales motorway (M4), the Midlands–South West motorway (M5) and an urban motorway spur to the centre of Bristol (M32). These roads provide excellent access to the hospital.

Frenchay Hospital is also the major accident and emergency centre for northern Bristol, North Avon and South Gloucestershire and is also the South-West Regional Centre for thoracic and plastic surgery and neurosurgery. Thus expertise in all specialties is readily available at the hospital. The Intensive Care Unit is administered by the Department of Anaesthetics and provides the resuscitation service within the hospital.

DEVELOPMENT AND OBJECTIVES
In 1970, it was decided to assess the feasibility and value of a mobile resuscitation service based at
Frenchay Hospital. A pilot trial, using a taxi for transport for the doctor (an anaesthetist) and his equipment, was set up for a period of 6 months. This study showed that there was a need for such a service, but that it would have to work in close association with the ambulance service, utilizing a fully equipped resuscitation ambulance and crew based at the hospital rather than at the ambulance station.

Early in 1972, a full ambulance-based Mobile Resuscitation Unit (MRU) was established at the hospital in conjunction with the Gloucestershire Ambulance Service (the Frenchay Hospital District, since the reorganization of the county boundaries in 1974, is now within the Avon County Area, the ambulance service of which has continued the project).

The objectives of the scheme were:

(i) To provide a comprehensive and skilled mobile resuscitation service within the area served by the hospital for all patients requiring resuscitation regardless of the underlying disease or injury.

(ii) To train ambulance men in both the basic and sophisticated techniques of resuscitation, to enhance their diagnostic skills and to bring together the ambulance and hospital services in their common objective of patient care.

THE HIGHER TRAINING OF AMBULANCE MEN

At the outset, it was decided that as an integral part of the scheme ambulance men should receive training in hospital in the principles and techniques of resuscitation. This would improve the general standard of training of the ambulance personnel in our area, and would ensure that they would act not only as highly skilled assistants, but also would be able to provide a high standard of resuscitation themselves.

The men are carefully selected by the Chief Ambulance Officer and the Ambulance Training Officer and are trained in two groups:

(a) Long term. The indications for and techniques of intravenous infusion, endotracheal intubation and d.c. defibrillation of the heart are taught. This requires a high degree of understanding and skill.

(b) Short term. Basic resuscitation techniques are taught and some familiarity with the more sophisticated methods imparted so that these men may provide skilled assistance.

Selection of candidates for the long course is based on their performance in the short course.

Duration of training

Initially, the long course lasted 1 year, but the progress of the three men who commenced the course was so favourable that the time has been reduced to 4 months. The period of short-term training is 1 month. Two men attend each course, allowing up to six long-term and 24 short-term candidates to be trained in a year.

Service commitment during training

The trainees man the MRU, which is based at the hospital, for 11 hours a day, Monday to Friday. The men provide the vehicle crew on a rota basis; one short-term man and one long-term man forming each crew. The vehicle responds to an average of two calls per day, each taking 45 minutes approximately.

At other times, the crew comprises fully trained men who have the opportunity to practise their skills.

Syllabus and areas of training

Before coming to the hospital, each man undergoes a short revision of basic knowledge, supervised by the Ambulance Training Officer.

The hospital training programme includes a series of 24 tutorials by members of the medical and nursing staff. There are practical demonstrations and practice in techniques of resuscitation and immediate care in the Accident and Emergency Department, the Intensive Care and Coronary Care Units, the anaesthetic, recovery and operating rooms and selected wards. The men attend every cardiac arrest case in the hospital as part of the hospital resuscitation team. The hospital carries a full range of training models and simulators in a special resuscitation teaching room.

During the period of 4 months' secondment, each man performs venepuncture and endotracheal intubation on 150-300 occasions. He attends about 40-50 cases of cardiac arrest.

The aim of the course is not only to teach practical skills, but to educate in the rationale of resuscitation techniques. The importance of basic principles is emphasized; for example, the men are encouraged to use a bag and mask where possible and to reserve endotracheal intubation only for conditions where it is essential. Although the value of endotracheal intubation and venepuncture are taught, the dangers of prolonged attempts at either are emphasized also. It is the aim of the course to produce men who are mature and experienced in judgement as well as competent in technical skills.
The course is organized jointly by the Ambulance Training Officer, a Nursing Officer, a Consultant Anaesthetist and a Registrar or Senior Registrar Anaesthetist. The day-to-day charge of the men is in the hands of a Nursing Officer and the men have a weekly conference with the Consultant Anaesthetist.

We have had excellent inter-departmental cooperation within the hospital. Many lecturers have commented on the interest and competence of the men.

**Assessment**

All short-term, and some long-term, men compile a case study which covers the period from the patient's arrival in an ambulance to his discharge from hospital. One of these studies has been published (Jenkins, 1974). The short-term men have a multiple choice question (MCQ) examination at the end of the course and receive a certificate if they satisfy the assessors and examiners.

The long-term men have a written examination at the mid-point of their course and further written examinations at the end, consisting of both MCQ and essay questions, an oral examination and an assessment of their practical skills at artificial ventilation, bag and mask ventilation, endotracheal intubation, venepuncture, intravenous infusion and use of the e.g. oscilloscope and defibrillator. A certificate is issued to successful candidates.

**Retention of skills and refresher courses**

Successful long-term men are issued with an emergency bag for their own personal use. This bag contains equipment for artificial ventilation, endotracheal intubation, venepuncture and intravenous infusion. The men are allowed to use it for a period of up to 12 months after they finish hospital training. They must then return to hospital for a period of refresher training and reassessment. All men who have returned so far have shown that they have maintained their levels of knowledge and skill. The optimum period for refresher training seems to be 2 weeks each year or 1 week every 6 months.

**MEDICAL STAFFING OF THE MRU**

Although highly trained ambulance men can cope with many emergency calls, there are occasions when a doctor is needed, for example when there is a problem of diagnosis or when drugs are required.

The registrar or senior house officer anaesthetist on duty in the Intensive Care Unit may accompany the MRU, provided a colleague can deputize for him in the hospital. In practice, no problem has arisen in the Intensive Care Unit while the anaesthetist has been on an MRU call and only on very rare occasions has he been unable to go.

Participation in MRU service is voluntary and is not part of the anaesthetist's contract. Nevertheless, almost all of the junior anaesthetic staff have participated and have enjoyed the experience. Most doctors have learned about immediate care from the ambulance men and have a respect for their skills. The doctors have learned also to apply resuscitation techniques in the unusual circumstances of the roadside, of the home or of the factory floor.

A doctor attends about 200 calls a year. The average absence from the hospital is 37 minutes (tables V and VI).

**THE VEHICLE AND ITS EQUIPMENT**

The original vehicle was based on a Bedford C.F. chassis powered by a 2-litre engine with an automatic gearbox. The ambulance conversion was made by H. Lomas Ltd (Wilmslow) and was designed to carry one patient only, with the rest of the space available for equipment and attendants. The front passenger seat was removed and a revolving seat for the attendant or doctor was placed at the head of the stretcher. The object of this design was to have a small and lively vehicle which could reach the accident site easily. In practice, however, the vehicle proved to be rather too small and underpowered, and there was not sufficient working area inside. Nevertheless, this vehicle served as a useful prototype.

The present vehicle is based on a Ford Transit chassis with double rear wheels and is powered by a 3-litre engine with an automatic gearbox. A simple ambulance conversion was made by H. Lomas Ltd and the vehicle was delivered in shell form for internal fittings to be made at the hospital.

We have found that only one stretcher is needed. This may be situated on the offside for optimum comfort of the patient. There is sufficient room for a seat to be fitted at the head of the stretcher, behind the driver. The stretcher may be positioned also in the centre of the vehicle if necessary. The defibrillator and e.g. oscilloscope and telemetry equipment are kept in a built-in rack and all small equipment is kept in drawers. A second set of equipment for i.v. infusion, airway protection and endotracheal intubation and drugs is in two doctors' bags in the rear of the vehicle for use outside the ambulance.
There are seats for two attendants at the rear of the vehicle. A wall rail (British Oxygen Company) is fitted along the length of the vehicle side above the stretcher to carry respiratory resuscitation equipment, suction apparatus and a sphygmomanometer. An overhead rail can be used for suspending i.v. infusion fluids. There are two stout ceiling racks running the length of the patient compartment, which serve also as hand rails. There is a further storage compartment above the driver's and passenger's heads. The vehicle has a single "up-and-over" door at the rear which protrudes when open, providing protection in bad weather. A double red and blue flashing light is fitted to the roof. There is a small external compartment for basic rescue tools. The vehicle interior is wired for both 12-V and 240-V equipment to permit recharging of the batteries of the electrical equipment. There is an interior heater powered by the ambulance supply and also a small fan heater and an electric blanket which are supplied by the 240-V source to keep the vehicle and stretcher warm when the vehicle is parked at the hospital. There is a special parking bay with a 240-V mains supply, situated opposite the Accident Department. A list of the equipment is in the Appendix.

Communications

The new vehicle is equipped with a multichannel Pye Westminster radio transceiver working normally through an ambulance control station. A similar set is situated in the Accident and Emergency Department of the hospital and direct talk-through facilities between the hospital and the MRU can be arranged easily. There is a direct telephone line between the ambulance control and the hospital.

Recently e.c.g. telemetry between the MRU and the hospital has been incorporated. Practice trials are encouraging and further clinical trials are being undertaken (Baskett, Cochrane and Cox, 1974).

THE SERVICE PROVIDED BY THE MRU

Call-out arrangements

The local Ambulance Controller receives the initial call and decides whether to call the MRU to a case and whether to ask for a doctor and nurse to accompany the vehicle. He communicates by direct telephone line to the hospital switchboard staff who summon the ambulance crew, doctor and nurse using electronic pages equipped with speech facilities. Further information about the patient is given to the crew over the ambulance radio while the MRU is en route.

Selection of cases

At the outset, it was decided that the MRU would attend all "suddenly and seriously ill" patients within a 20-minute radius of the hospital. The vehicle is used also for inter-hospital transport for any very ill patient in the area.

RESULTS

In the first 15 months, the MRU was called to an average of about 600 cases per year; the doctor attended about 30% of these. Thirty per cent of the calls were to road accidents, 20% for myocardial infarction and 50% for other medical emergencies. Thus the doctor might expect to accompany the Unit about four times a week.

After gaining experience of the service, we revised our evaluation techniques, on the basis of the DHSS-recommended ambulance report form, amplified to elicit extra information about the value of the ambulance men’s training, the vehicle equipment and the participation of the doctor. Clinical information about the patient and changes in his condition were recorded and the equipment used was noted together with the value of hospital training in the circumstances, an assessment by hospital staff of the ambulance men’s performance and a record of the progress of the patient in hospital. In addition, the doctor completed a report on each case attended by him.

TABLE I. Number and nature of sorties over a recent 4-month period

<table>
<thead>
<tr>
<th>Nature of case</th>
<th>No.</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accidents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road</td>
<td>40</td>
<td>23</td>
</tr>
<tr>
<td>Industrial</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Home</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Sports</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Burns</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Poisoning (not drug overdose)</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac</td>
<td>47</td>
<td>28</td>
</tr>
<tr>
<td>Drug overdose</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>Respiratory</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Fits</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Cerebrovascular accident</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>&quot;Collapse&quot;</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Diabetes</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Surgical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute abdomen</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Haemorrhage</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Dissecting aneurysm</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>Patient dead on arrival of MRU</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>170</td>
<td></td>
</tr>
</tbody>
</table>
TABLE II. The use of special equipment in a recent 4-month period

<table>
<thead>
<tr>
<th>Nature of case</th>
<th>Total numbers</th>
<th>Arterial pressure and e.c.g.</th>
<th>I.V. cannulation</th>
<th>I.V. drugs</th>
<th>Laryngoscopy and intubation</th>
<th>IPPV</th>
<th>Defibrillation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accident</td>
<td>170</td>
<td>28</td>
<td>30</td>
<td>17</td>
<td>31</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Accident</td>
<td>(100%)</td>
<td>(16%)</td>
<td>(18%)</td>
<td>(10%)</td>
<td>(18%)</td>
<td>(6%)</td>
<td>(2%)</td>
</tr>
<tr>
<td>Road</td>
<td>40</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>21</td>
<td>0</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Disease</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac</td>
<td>47</td>
<td>17</td>
<td>12</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Overdose</td>
<td>16</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Respiratory</td>
<td>9</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Other medical</td>
<td>20</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other surgical</td>
<td>6</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Patient dead</td>
<td>11</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

The number and nature of the calls for the MRU service are shown in table I for a recent 4-month period. Compared with our early experience, there was a reduction in the number of road accidents resulting possibly from the increased cost of fuel, a reduction in the speed limit and the opening of further sections of motorway.

The use of special equipment for different types of emergency is shown in table II. The drugs used most frequently were pentazocine, diazepam, sodium bicarbonate, atropine, adrenaline, isoprorenaline, lignocaine, frusemide and dextrose 50%. Entonox was the analgesic of first choice in the majority of cases.

As a result of their training, the ambulance men felt more confident in dealing with a significant number of patients, particularly of medical emergencies (table III). This observation was supported also by the views of the receiving hospital staff and the accompanying doctor. The staff of the Accident Unit were asked to compare the value of the care delivered by the MRU staff with that of a standard ambulance crew (table IV). Fifty-six per cent of the calls made by the MRU were estimated to have been valuable or potentially valuable. Of patients carried on these useful journeys, more than 80% survived. Six patients' lives were "definitely" saved and a further 18 would probably not have survived had the services of our MRU not been available. In coming to these conclusions, the opinions of the ambulance men in attendance, the hospital doctor (if any) accompanying the vehicle and the hospital receiving team were considered. No patient died in transit. In some patients who were recorded as "dead on arrival" of MRU, attempts were made at resuscitation but all these attempts failed. However, two patients suffered cardiac arrest in transit and were resuscitated successfully.

The hospital doctor was thought to be needed in 41% of the trips which he made with the MRU (table V) in order to manage acute cardiac or respiratory disease. In addition to treating the patient, the doctor's presence can improve training and communication within the team. In only one instance was a doctor required but not available. Because of the shortage of nurses within the hospital, a nurse accompanied the MRU on infrequent occasions and her value is difficult to assess. In the presence of highly trained ambulance men, it is probable that a nurse would be of most value when there is more than one patient.

The time from the receipt of a call to being mobile with a doctor on board has varied from 30 seconds to
2.5 minutes (table VI). The service is limited, in general, to a 20-minute radius of the hospital.

The following short accounts are intended to exemplify some of the ways in which such a unit can be of value or abused. While there are a few hoax calls, the usual cause of a frivolous call is erroneous information as a result of public ignorance.

**Table VI. Time of calls (minutes)**

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to reach incident</td>
<td>1</td>
<td>28</td>
<td>10.3</td>
</tr>
<tr>
<td>from initial receipt of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>call</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time MRU absent from</td>
<td>5</td>
<td>97</td>
<td>37.1</td>
</tr>
<tr>
<td>hospital</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Case 1**

During construction of a cable tunnel under the River Severn, a lift broke and two men fell to the bottom of the shaft. The doctor in the MRU was lowered down the shaft in a bucket and found one patient with a possible spinal fracture. The other was hypotensive with a fractured tibia and fibula. Both wounds were immobilized appropriately and the patients were raised from the shaft. Blood for cross-matching was taken from the shocked patient and an infusion of dextran was started. The patients were given pentazocine i.v. and Entonox to provide analgesia for the journey to hospital.

**Case 2**

A patient was suffering from a “myocardial infarct”. When the MRU arrived, the patient was found, in fact, to be suffering from mild abdominal pain, possibly subacute indigestion.

**Case 3**

A patient was suffering from a myocardial infarction. The diagnosis was found to be correct and the condition of the patient complicated by left ventricular
failure. The patient was given frusemide i.v., pentazocine and aminophylline and was transferred to hospital receiving oxygen and monitored with an e.g. oscilloscope.

Case 4
The Unit was called to a patient suffering from poisoning and situated inside a telephone box. A schoolgirl was found alive and well and she stated that she had taken eight aspirin tablets. She was sent back to school, but later appeared at the hospital's Accident Department. She was admitted overnight as a matter of departmental policy and discharged the next day symptom-free.

Case 5
A car driver had collapsed. On examination he was found to be suffering from acute left ventricular failure. His pulse rate was 40 per minute. He was given frusemide and atropine i.v. and oxygen. On transfer to the ambulance, he developed a cardiac arrest; the trachea was intubated, the lungs were ventilated with oxygen and the patient was given cardiac massage, intravenous calcium gluconate and sodium bicarbonate. The heart restarted and the patient was taken to the Intensive Care Unit where he survived to leave hospital in reasonable health.

Case 6
A woman had "collapsed" at a local sausage factory. The doctor and ambulance staff were greeted by two foremen who asked them to take a woman employee home as she had been upset. The Unit returned to hospital.

Case 7
A driver was involved in an accident in which his lorry hit the rear of a similar vehicle. He received head and maxillo-facial injuries and was unconscious and trapped in his vehicle. As the MRU arrived, he was inhaling blood into his trachea. The ambulance man secured his airway by passing an endotracheal tube and performing tracheal suction, and oxygen was administered. Shortly afterwards, the patient regained consciousness. He made a good recovery following maxillo-facial surgery in hospital.

DISCUSSION AND CONCLUSIONS
Most other specially equipped ambulances and medically manned resuscitation services in operation at present confine their activities to either road accidents or mobile coronary care. Often this is because the work is pioneered by either an accident surgeon or a cardiologist.

Our experience has shown that, while approximately two-thirds of our work comes from these sources, there are many patients, requiring resuscitation, who are not in either category. A smaller volume of work would not have justified continuing our Unit. It would seem that the concept of using the Unit for all those in need of resuscitation, regardless of the cause, is justified.

We feel that highly trained ambulance men can cope with the majority of problems associated with road accidents. The doctor was required in only 7% of road accidents although he was of special value in a large proportion of the medical emergencies (heart disease 34%, respiratory disease 22%) for diagnosis and the administration of drugs.

The participation of an intensive care unit anaesthetist has been a success. It has been a popular activity and the anaesthetists have coped well with emergency medicine. When an anaesthetic department provides a resuscitation service within the hospital which is separate from an emergency anaesthetic service, we have found that problems of staffing can be avoided.

At the outset of this project, insurance cover for doctors and nurses attending accidents was refused by the Department of Health and Social Security and the Hospital Management Committee took out a private insurance policy to cover the doctors and nurses accompanying the MRU. Recently, the Department of Health and Social Security has introduced its own flexible insurance plan which will cover any doctor attending an accident in an official capacity.

The combination of service and training for ambulance men has been successful. There is no doubt that selected men can become proficient in the technical skills of endotracheal intubation, intravenous cannulation and defibrillation in a period of 4 months, but the acquisition of these skills should be combined with adequate theoretical instruction on the principles involved and the dangers of and contraindications to these techniques.

Some of the long-term trained men have felt frustrated in returning to normal service after working with the MRU and miss the facilities provided by the special vehicle. This has, to some extent, been mitigated by the provision of a personal kit containing equipment for endotracheal intubation.
Opinions on mobile resuscitation differ. Some workers claim the advantages of a wholly doctor-manned service, while others report equally excellent results using paramedical personnel only. It would seem to us that the best arrangement is to have both when possible and necessary, and that anaesthetists are well qualified to act as the medical officer on the MRU.

The cost of the extra equipment in the vehicle is approximately £1500–2000 depending on the choice of models and manufacturer. The cost of the salaries of the ambulance men can be offset against the fact that they perform a certain amount of service while training. Taking these factors into account, over the period of 4 months studied in depth, the cost of a life "definitely saved" was estimated to be £250 and of a life "possibly saved" £100.

APPENDIX

Special equipment in the Mobile Resuscitation Unit

(* Duplicated in doctors' portable bags for use on site.)

Combined e.c.g. oscilloscope and defibrillator (Simonsen & Weel).
D.M.S. 200, rechargeable.
Coder for use with e.c.g. telemetry (Simonsen & Weel).
Large oxygen cylinder piped to outlet on wall rail.
Large Entonox cylinder (200 litre) piped to demand apparatus on wall rail.
Small portable oxygen hand set
Small portable Entonox (500 litre) 
{ for use outside vehicle
Bag and mask (Ambu).
Ozorio interlocking system (Penlon) and modified T-piece for ventilating infants.
Rechargeable electric suction apparatus (Laerdal).
Sphygmomanometer (aneroid type).
Laryngoscope—adult and child.*
Assorted endotracheal tubes and connections.*
Guedel airways.*
Nasopharyngeal airways.*
Assorted suction catheters.*
Intravenous infusion sets (Baxter Laboratories).*
Intravenous cannulae (Venflon).*
Butterfly i.v. sets (Abbott).*
Hartmann's solution for i.v. infusion.*
Purified plasma protein fraction for i.v. infusion.
Macrodex 6% for i.v. infusion.
Sodium bicarbonate 4.2% for i.v. infusion.
Blood grouping and haemoglobin sample bottles.*
Stationery and pens.
Pocket tape recorder.
Drugs: pentazocine, diazepam, ketamine, atropine, lignocaine for i.v. infusion, practolol, lignocaine 2%, adrenaline, isopenaline, calcium chloride, aminophylline, ergometrine, frusmide, hydrocortisone, piriton and dextrose 50%.
Assorted syringes and needles.*
Spinal board and cervical collars.

Acknowledgements

The introduction of this project and its maintenance have been dependent on the enthusiasm, goodwill and tolerance of an enormous number of people—too numerous to mention by name. The authors would like to thank their medical, nursing and administrative colleagues at Frenchay Hospital, the Ambulance and Medical Officers of Gloucestershire and Avon Ambulance Services and, in particular, the many Anaesthetic Registrars and S.H.O.s who accompanied the vehicle on its calls and the men of the Gloucestershire and Avon Ambulance Services.

Our thanks are also due to Miss J. Foster for preparation of the manuscript.

REFERENCES

Reanimation urbaın mobile: formation et service

On décrit dans cette communication la création d'une unité mobile de réanimation ayant pour base l'hôpital général d'un district. Cette unité a pour personnel des ambulanciers formés dans les hôpitaux et le cas échéant un anesthésiste. La formation des ambulanciers, l'organisation du service et les résultats obtenus sont discutés dans ce document. Les auteurs recommandent la création d'une unité de ce genre en association avec un hôpital général de district urbain pour apporter un secours immédiat à tous les patients qui deviennent subitement gravement malades, quelle que soit la cause de leur maladie ou de leur accident.