clear pointer to possible pituitary deficiency and is an important physical sign in newborn boys.

We thank Dr D Stone and Dr A J Franklin for permission to report their patients. Plasma adrenocorticotrophic hormone was kindly measured by Professor Lesley H Rees in the department of chemical endocrinology at St Bartholomew's Hospital, London. Other hormone assays were performed in the department of chemical pathology at the Hospital for Sick Children, London.

References

- ¹ Wilson JD, Griffin JE, George FN, Leshin M. The role of gonadal steroids in sexual differentiation. *Recent Prog Horm Res* 1981;**37**:1-39.
- ² Clements JA, Reyes FI, Winter JSD, Fairman C. Studies on human

sexual development III. Fetal pituitary and serum, and amniotic fluid concentrations of LH CG and FSH. *J Clin Endocrinol Metab* 1976;**42**:9-19.

- ³ Cornblatt M, Schwartz R. Hypoglycemia in the neonate. In: *Disorders of carbohydrate metabolism in infancy*. 2nd ed. Philadelphia: W B Saunders Co Ltd, 1976:178.
- ⁴ Lovinger RD, Kaplan SL, Grumbach MM. Congenital hypopituitarism associated with neonatal hypoglycemia and microphallus: four cases secondary to hypothalamic hormone deficiencies. *J Pediatr* 1975;**87**:1171-81.
- ⁵ Moncrief MW, Hill DS, Archer J, Arthur LJH. Congenital absence of pituitary gland and adrenal hypoplasia. *Arch Dis Child* 1972;**47**:136-7.
- ⁶ Leblanc A, Odièvre M, Hadchouel M, Gendrel D, Chaussain JL, Rappaport R. Neonatal cholestasis and hypoglycemia: possible role of cortisol deficiency. *J Pediatr* 1981;**99**:577-80.
- ⁷ Flatau E, Josefsberg S, Reisner SH, Bialik O, Laron Z. Penile size in the newborn infant. *J Pediatr* 1975;**87**:663-4.

(Accepted 11 August 1983)

For Debate . . .

Paramedics in the United Kingdom?

A D REDMOND

There is no doubt that until recently the United Kingdom could boast the best ambulance service in the world. This is no longer the case. Standards have not fallen—indeed they have risen. The rest of the world, however, has caught up and in some places has overtaken us. These ambulancemen are no better trained than our own but are better equipped and allowed to do more. The obvious and best example to quote is the ambulance system now developing in the United States of America.

Twenty years ago there was no effective ambulance service in the United States. In many places any vehicle of suitable dimension was used to transport a sick or injured patient to hospital. Ironically, the most suitable vehicle to hand was usually the local hearse. It was no doubt difficult for the mortician to separate the demands of his patient and the demands of his profession. To overcome these problems many local communities developed a volunteer rescue squad. They fought fires, rescued trapped victims, and transported people to hospital. In an attempt to coordinate the many different squads, a programme of training was introduced in the early 1970s. This is now widespread and very well organised. The ambulancemen are referred to as emergency medical technicians, or EMTs. The basic emergency medical technician has between 80 and 140 hours of training, which covers basic anatomy and physiology and simple first aid. This "simple first aid" does, however, include a thorough training in cardiopulmonary resuscitation. This emphasis on control of the airway and belief in the positive effects of early cardiopulmonary resuscitation is a major contribution to the saving of life. A basic emer-

gency medical technician can then do further training to become an intermediate emergency medical technician. He has a further 60 to 200 hours of training and will be able to insert intravenous lines, obturator airways, and apply a medical antishock trouser suit. The obturator airway seals off the oesophagus and will allow air to go down only the trachea. There are many problems with this device including misplacement in the trachea and inducement of vomiting. It is rapidly losing favour in the United States. The medical antishock trouser suit is an inflatable suit put over the legs of the patient in an effort to increase peripheral resistance and thereby raise the blood pressure. It will also stabilise pelvic fractures. Having completed this training the emergency medical technician can then elect for even further training. A cardiac emergency medical technician can do all the above, but in addition can give drugs and defibrillate patients. A paramedic emergency medical technician does an extra 400 to 800 hours of training, and is then very well trained, and can give help equivalent to that of a trained physician in emergencies. The paramedics can pass endotracheal tubes, insert central venous lines, and interpret electrocardiograms to the envy of many a medical registrar.

There are problems, however, with training technicians to such a high level. As their knowledge and expertise is so wide and their capabilities are so great the medical profession feel a need to keep a close eye on their activities. Strict and lengthy rules are laid down for what they can do at the scene of an emergency, and usually any invasive action has to be preceded by permission from the local hospital. In addition, therefore, to the colossal expense of training these people and equipping them, there is the added expense of providing sophisticated radiocommunications with the hospital. Furthermore, when such a highly trained paramedic arrives at the scene, his whole training and *raison d'être* is to apply those skills that have been so hard won. Hence the main drawback with such a system is delay. When the paramedic arrives at the scene he has first of all to work through a check list. This includes taking a history and taking the patient's blood pressure, pulse, and an electro-

Stockport Infirmary, Stockport, Cheshire

A D REDMOND, MD, FRCS(ED), consultant in accident and emergency medicine

Correspondence and requests for reprints to: Mr A D Redmond.

cardiogram. Trapped or injured patients have to be stabilised on a backboard always. If an intravenous line is indicated then the paramedic has to contact the hospital via radio or telephone, which all takes time. There is a growing concern that in the treatment of trauma this may often be inappropriate and in fact life threatening. The main cause for concern is in the treatment of penetrating injuries, particularly from gunshot wounds and stabbings. Though we are fortunate not to see these wounds in Britain to the same degree as on the other side of the Atlantic, they do provide us with an example, albeit extreme, of what can happen when definitive treatment is delayed. If a major vessel has been ruptured by a bullet, or some other penetrating object, then the patient needs an operation. Any delay may be fatal. Unless the wounds are so devastating that the patient will die immediately or so trivial that there is no risk of appreciable haemorrhage, then with penetration of a major vessel the patient has only about 30 minutes in which to get definitive surgery. This, however, is usually the time it takes for an ambulance to be called, the ambulance to arrive, and the paramedics to complete their check list. The patient therefore arrives in the emergency department having suffered a cardiac arrest in the ambulance and cannot be resuscitated. This can best be illustrated with an example. While I was visiting a distinguished medical school in the United States the following case was discussed at a surgical meeting:

At about 11 00 pm a man was shot during a garage hold up. The incident was witnessed and the police were called. The police arrived at 11 07 pm. The police then called the paramedics, who arrived at 11 17 pm. They noted that the patient was fully conscious and complaining of pain around the wound in his abdomen. The paramedics then began to run through their check list, which included taking the patient's blood pressure and pulse. Both these were difficult to do and several attempts were made. An intravenous line was inserted and by the time all this was done the patient was finally loaded into the ambulance at 11 32 pm. At 11 42 pm—that is, only 10 minutes later—the patient arrived in the regional trauma centre. The patient had, however, died in the ambulance and could not be resuscitated. It is obvious from the times stated that if the policeman had simply put the man in his car and taken him straight to the hospital, which was only 10 minutes away, or if the paramedics had taken him straight to the hospital then the patient would have been talking and complaining of his abdominal pain when he arrived in the trauma centre. The necropsy showed a perforation of the small bowel and a laceration to the common iliac vein. These lesions were treatable and the patient would have lived.

It is becoming clear that in the management of trauma efforts to improve out of hospital care can go only so far. Paramedics are well trained, highly skilled, and well motivated. Their role in the treatment of trauma is, however, limited. The reverse is true for sudden cardiac arrest. It has been clearly shown by the workers in Seattle that the provision of a highly skilled and fast paramedic team can greatly improve the outlook for cardiac arrests out of hospital.¹

Present figures from Seattle show that for episodes of ventricular fibrillation outside hospitals, two thirds will be admitted with a pulse and blood pressure to hospital. Half of these will go home. Seattle is fortunate in that it has an enthusiastic and underused fire service. The city burnt down in the 1890s and has been determined never to repeat the episode. It has therefore furnished itself with 32 fire stations for an 18 × 6 mile (29 × 10 km) city. Furthermore, it has 14 major hospitals within this small area. When cardiac arrest occurs it takes 2 minutes 47 seconds for a fire engine and a basic emergency medical technician to initiate cardiopulmonary resuscitation. Two minutes later the intermediate emergency medical technician arrives, and two minutes after that a paramedic emergency medical technician who passes an endotracheal tube, interprets an electrocardiogram, and defibrillates when necessary. The paramedic will also stabilise any arrhythmias before transport. The other factor that the workers in Seattle have established

is that bystanders who initiate cardiopulmonary resuscitation the moment a cardiac arrest has occurred make a major contribution to the survival of that patient. An important success with resuscitation of ventricular fibrillation taking place out of hospital can be expected only if cardiopulmonary resuscitation is started within four minutes of the event and defibrillation accomplished within eight minutes. Furthermore, it is not necessary to have a fully trained paramedic arrive on the scene; a basic emergency medical technician who has received an extra 10 hours of training in defibrillation can achieve similar results if he gets there within the eight minutes.

The implications for the United Kingdom are obvious. We already have a well established, well disciplined, and well motivated ambulance service. They are experienced in the extrication of patients from vehicles and, along with their fire and police colleagues, perform an excellent service. The advances in management of trauma are to be made not in care received out of hospital but in that received in hospital. The American development of trauma centres bears witness to this.² For patients who have suffered serious trauma the most advantageous thing to do is "scoop and run," and our ambulance drivers are good at it. The patient must, however, be scooped up and run to a trauma centre. Such a place must be capable of resuscitating that patient and providing immediate surgery by senior surgeons experienced in trauma. If a smaller hospital is passed en route then so be it. The United States of America is accepting this and designating certain hospitals as trauma centres. We must do this too.

The advances in coronary care, however, are to be made outside the hospital. The first is to train most of the general public to initiate cardiopulmonary resuscitation within the critical four minutes. Until our ambulancemen are equipped with defibrillators, however, it is unlikely that patients in ventricular fibrillation will be saved in any great numbers. An ambulance will probably arrive within eight minutes, but ambulancemen can only carry on cardiopulmonary resuscitation and the chances of that patient surviving are very poor. If the ambulancemen had a defibrillator and could reverse ventricular fibrillation then the day may come when a third of these patients will be back home with their families, as they are in Seattle.

A relatively short time ago we had the best ambulance service in the world. The basic structure and the quality of the personnel still remains and indeed has improved. All that is lacking is the provision of defibrillators and once again our ambulance service will be the best.

References

- 1 Cobb LA, Hallstrom AP. Community based cardiopulmonary resuscitation—what have we learned? *Ann N Y Acad Sci* 1982;382:330-42.
- 2 Trunkey DD. Trauma. *Sci Am* 1983;249:20-7.

(Accepted 13 October 1983)

Does altitude affect the reading of blood pressure, either with a mercury or with an aneroid sphygmomanometer?

Changes of altitude may affect the blood pressure of an individual, but they do not have pronounced effects on the recording of that blood pressure. The conventional sphygmomanometer is exposed at both ends to prevailing atmospheric pressure (it is not a barometer). Similarly, the bellows of the aneroid sphygmomanometer are exposed to ambient atmospheric pressure, as is the patient in whom the blood pressure is measured. Blood pressure is not an absolute value: it is the pressure difference between the circulatory system and ambient atmospheric pressure. Thus if systolic blood pressure is 120 mm Hg and atmospheric pressure is 760 mm Hg absolute systolic pressure will be 880 mm Hg.—R THOMAS, physicist, Glasgow, and A F LEVER, director, blood pressure unit, Glasgow.