Reflections on twenty years of prehospital care

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Although Accident and Emergency staff may feel that prehospital care is the province of the ambulance service alone, their interest in this area is important. Both A&E doctors and nurses have an important role to play in the training of paramedics, and in some circumstances in the direct provision of prehospital care. Physician involvement in routine prehospital care, whether by land or helicopter transport, is still controversial. This paper reviews some of the issues involved in prehospital care over the last twenty years, in addition to a personal perspective from the author. In the absence of a firm evidence base to lead the way to future development in Hong Kong, more research will be needed by doctors, nurses and ambulance staff. (*Hong Kong j.emerg.med.* 2000;7:213-219)

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Introduction

The scope and organization of prehospital care has changed markedly over the last twenty years. The stimulus for many of these changes originated in the United States in the 1960's and 1970's, and lay in the discrepancy between the excellent care given to American soldiers fighting in Vietnam, and the substandard care available to ordinary citizens in the U.S.A. itself. The termination of America's direct involvement in the conflict in 1973 led to the availability of significant numbers of skilled paramedics, just at the time when the problem of civilian trauma in the U.S.A. became recognised. This pool of expertise was employed, often haphazardly, to improve America's prehospital services. However, fears concerning the accountability and effectiveness of these services[1] led to a system of protocol-driven practice, and even to direct on-line control of paramedic activities led by doctors. While this system undoubtedly has some beneficial features, it tends to discourage the development of problem-solving skills by paramedic personnel and ambulance staff. Although on-line control is effective in ensuring medical oversight, it can be expensive because of the need to have an experienced physician available for advice at all times. The physician experience and training needed to perform successful and consistent on-line control may not be available in all localities, and one of the key aims of the National Association of EMS physicians in the U.S.A. was to try to improve this situation.[2]

In the United Kingdom, where the ambulance service has been part of the National Health Service since 1974, paramedic practice has developed differently.[3] There is no on-line medical control, few ambulance services have medical directors, and paramedics practice more autonomously, including the use of drugs.[4] While working to defined protocols, there is an increasing emphasis on paramedics learning clinical assessment skills as well as practical procedures. Paramedics are fully accountable to their own service, often through the service's paramedic steering committee which includes doctors from the disciplines of Accident and Emergency, Cardiology and Anaesthesia. Even for services which have a medical director, such a committee can provide an excellent means of independent audit of paramedic practice, including impartial adjudication in cases of alleged error.

In Hong Kong, the ambulance service developed for many years along the lines of the British system,

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and still retains many similar structural features. However, there has been some divergence in the development of extended training, with Hong Kong adopting the Canadian EMA system, currently to level II and with a plan to upgrade key staff to level III. The history of this development is comprehensively covered elsewhere by Lo, Lai and Mak.[5] The ambulance service has immense potential for future development, but upgrading to true paramedic practice will require some years of work, and perhaps less emphasis on a disciplinary framework, to allow more professional autonomy. Paramedics, as skilled practitioners, will be just as prone to errors of judgement as doctors and nurses, but they must never practise defensively in fear or dread of such mistakes, which are likely to be rare.

A personal perspective

My first involvement with prehospital care took place almost exactly 20 years ago, working with the flying doctor service in Sabah, East Malaysia, during my final-year student elective. This state, previously known as North Borneo, was at that time a largely unspoiled expanse of primary rainforest, with some villages in the interior being three days walk from any centre of population. Many entire villages would be housed within one or two long-houses, and the people relied solely upon the flying doctor service for Western medicine, and the local bomo (witch doctor) for other problems. Occasionally, these two disciplines came into conflict, an example being a small baby I examined with an ulcerated scalp, following the bomo's treatment of a simple case of cradle-cap with quicklime. Most of each village took the opportunity to visit the service when the helicopter dropped in once a month, whether ill or not, and vast quantities of paracetamol, worm tablets, malaria pills and cough medicine were dispensed from large plastic containers. The seriously ill and injured were taken back by the helicopter to Queen Elizabeth Hospital in the capital, Kota Kinabalu. My interest in Accident and Emergency Medicine was a direct result of that elective attachment.

Back in London, as an SHO and later registrar in A&E, I went on numerous "E" team calls to railway accidents and other incidents outside hospital. The railway incidents usually involved a psychiatric patient attempting (often successfully) to kill themself by jumping in front of a London underground train. I eventually managed to collect 100 cases for a paper in the BMJ.[6] The first few incidents I dealt with personally taught me that one needs to fall back on basic principles of trauma care, in order to avoid mistakes caused by the excitement and adrenaline rush of a fast ambulance ride and the unfamiliar environment. After my first railway job, the knots in my stomach persisted for hours, but I was convinced that this area of Medicine would be one of which I would never become tired.

My Senior Registrar job in Greater Manchester (1987-90) offered the chance to become involved in ambulance training at a time when extended skills were being introduced. During my time there, defibrillation training for 700 staff was completed, and by the end of my stay, full Paramedic training was in full swing.

During my first period of consultant responsibility, at the Hammersmith Hospital (1990-95), I set up a hospital flying squad which, by 1993, had two vehicles of its own. (Figures 1 & 2) The first was an estate car (call-sign DA18), equipped to provide advanced prehospital care and carrying an A&E doctor and nurse, sometimes with a paramedic as well. Mostly, however, the A&E doctor did the driving, on blue lights and sirens, to the scene of the incident. We thought it wise to approach the local traffic police for driver training, both for reasons of safety, and also so that they might view minor infringements of the speed limit more kindly! In over 500 emergency calls, there were three minor

Figure 1. Hospital Flying Squad. Volkswagen Passat estate car (DA18).

road traffic accidents involving the car, none of which could really be attributed to the fault of the doctor. Eventually, however, the hospital security staff were put through a full two-week ambulance service emergency driving course to relieve the doctors of the stress of driving.

Following a number of frustrating off-road accidents which neither we nor the ambulance service could reach by vehicle, we decided to acquire a 4-wheel drive capability. The second vehicle (DA181) was a Ford Transit 4 x 4 van, equipped with an Aireshelta tent and enough medical equipment to create a small field hospital at the site of a major disaster. (Box 1) A hot water kettle, drinks and pot noodles were also provided for the benefit of staff who might miss their lunch or dinner. This van and its equipment were extensively used for training and provided facilities for medical care at two London Marathons, the annual Notting Hill Carnival, and also the Canary Wharf bombing in 1996 (just after my departure). In addition, it proved useful at an incident in 1994 when a malicious pepper-spray attack affected 40 people in a crowded pub in London.[7] On that occasion, the van was loaded up with large numbers of hospital gowns and blankets. These were essential to cover patients who had to remove their contaminated clothes on the December night.

New developments in Hong Kong

Until recently, opportunities for doctors in Hong Kong to become interested and involved in advanced prehospital care have been limited. Some have become involved in training and service within the Auxiliary Medical Services, Hong Kong Red Cross and St. John Ambulance, but few have had the chance to develop advanced prehospital skills at the cutting edge of emergency care. This situation has recently changed with the creation of a new Medical Auxiliary Section within the Government Flying Service (GFS). On every weekend and every Public Holiday, GFS helicopters now carry a doctor on both casevac (casualty evacuation) and search and rescue (SAR) missions. GFS now has the ability to winch a doctor onto ships at sea, and into remote inland areas, to help rescue and treat seriously ill or injured patients before rapid transfer to hospital. (Figures 3 & 4) The Accident and Emergency doctors involved in the scheme, jointly organised

Figure 2. Hospital Flying Squad. Ford Transit 4 x 4 van (DA181). Major incident unit.

Figure 3. Government Flying Service - helicopter landing at hospital helipad (August 2000).

Figure 4. Government Flying Service - helicopter team transferring patient at Siu Sai Wan helipad during a search and rescue (SAR) mission (August 2000). (Photograph kindly provided by Oriental Daily News)

Box 1

The Ford Transit Major Incident Vehicle carried the aireshelta with its associated petrol fan, generator and lighting, together with sufficient equipment to manage 50 major casualties and larger numbers of minor injuries. Schedule of equipment carried:

Aireshelta
1 Aireshelta 4.5 x 4.5m
2 Low-pressure Fan - LPG/Petrol
3 Cylinder Propane LPG, 11 kg
4 Can Unleaded Petrol, 10 litre
5 Anchorage Kit
6 Bottle Motor Oil 15W50, 500 ml

Site Clearance/Light Rescue
1 Machete
2 Chainsaw - Electric 240v
3 Tree Saw
4 Splitting Maul
5 Axe
6 Bottle Chain Oil, 500 ml
7 Crowbar
8 Rope-climbing, 50 m x 10 mm
9 Rope-abseiling, 50 m x 10 mm

Communications
VHF ICOM 200T
MOTOROLA Handportable GP300
Pump Mast Aerial
Lubricant for PMA
Installed Cellphone Kit

Electrical Equipment
1 12v/240v Refrigerator
2 Generator 4 KVA
3 Electric Kettle
Emergency Lighting

Pharmacy
20L (1 litre bags) Saline 0.9%
20L Haemaccel
Drugs Case: Contents list appended

Suxamethonium in refrigerator
Atracurium
ATT x 20 doses

All drugs stock - rotated by Pharmacy

Medical Gases
5 x "D" size O_2
25 x "E" size O_2
2 x PD size O_2
4 x "D" size ENTONOX

Medical Equipment
4 x MMT Response Bags
1 x Nebuliser - PD Cylinder, O_2 Driven
1 x Heartstart 3000 Defibrillator
1 x Entonox Delivery System with "D" Cylinder
1 x Ventilator - Ambumatic
2 x Donway Traction Splints
10 Spinal Boards (Portaboard)

5 x Burns Sheets
1 x Amputation Set
1 x Thoracotomy Set
Pulse Oximeter
Box of 16 Ambu Spur Bags
1 x York 4 Stretcher Trolley
6 Stretchers

Personal Protective Clothing
8 Green/Yellow Reflective Jackets
4 "Doctor"} interchangeable markings
4 "Nurse" }
8 Yellow Hi-visibility Jackets
4 Doctor
4 Nurse
8 Sets Green Overtrousers
8 Sets Reinforced Wellington Boots
4 Protective Helmets - Green
4 Protective Helmets - White/Red
4 Headlamps - Battery
4 Spare Sets Batteries
8 Pairs Gardening Gauntlets - Leather
4 Chemical/Biological Splash Suits
8 Pairs Heavy Boot Socks
8 Woollen Sweaters
2 Boxes 50 Rubber Surgeons Gloves (non-sterile) (M/L)
8 Pairs Marigold Heavy Duty Rubber Gloves

Glovebox

Untoward Incident Documentation
1 Major Incident Plan
1 Large Format A-Z
1 Pad Patient Report Forms

Major Incident Documentation Box

2 Pads Report Forms
100 Casualty Tags (Cambridge Cruciform)
2 Clipboards
5 Sets Casualty Logs (Numbered 1-200)
5 Sets Radio/Message Logs

by GFS and the Hong Kong College of Emergency Medicine, will gather valuable expertise which may be used later to improve all emergency services. Doctors who are familiar with the problems faced by prehospital care providers are much more likely to be able to give informed input to the planning process of the emergency services.[8]

Doctors in prehospital care?

How useful are doctors when directly involved in prehospital care? Several strong viewpoints have been put forward in the past, reflecting different philosophies.[9-12] One of the strongest groups advocating medical involvement in the U.K. is BASICS, the British Association for Immediate Care. Over the last 20 years, the organisation has matured from a modest group of enthusiasts into an influential body which has secured good professional standards. Members of BASICS featured prominently in negotiations with the Royal College of Surgeons of Edinburgh to develop a new Faculty of Prehospital Care in 1996, and in the subsequent creation of a Fellowship examination in immediate care. The development of sophisticated paramedic practice in the U.K. ambulance service might be seen by some as rendering medical involvement obsolete. Far from it - the improvements within the ambulance service and the strong teamwork between doctors and paramedics have all made possible a level of care undreamed of 20 years ago. Doctors are intimately involved in the training and examination of paramedics, and ambulance staff know that they are able to call for on-scene medical assistance when appropriate. The Royal London Hospital Helicopter Emergency Service (HEMS) is staffed with a doctor and paramedic, and adds an extra level of sophistication to trauma management. An increasing number of patients owe their lives to the immediate use of on-scene thoracotomy by these and other doctors following stabbing incidents.[13-15]

Helicopter doctors in Hong Kong?

As mentioned previously, this is already a reality. Whether the service can be extended to 7-day coverage remains to be seen, but experience even within the first month suggests a benefit to patient care. Experience from other countries may not be applicable to the Hong Kong situation, but overseas studies have reported mixed results regarding the benefit of carrying a doctor to emergencies.[16-20] Considering ground transport, little difference in outcomes was observed by Hampton et al. in a study comparing non-medical and medical staffing of a coronary ambulance.[21,22] Sherman[23] produced similar conclusions. The coronary care studies were undertaken before the widespread use of thrombolytic therapy for myocardial infarction, but even in this case, it would be feasible to teach paramedics to administer the necessary drugs, particularly if ECG telemetry to hospital could be used.[24]

The case for airborne doctors is no clearer.[25] Detailed independent studies of the London HEMS helicopter comparing performance with standard care provided by ambulance staff only detected a small benefit in severely injured patients, with some evidence of detriment to those with less severe trauma.[26] However, the HEMS team identified additional potential benefit to those patients with intracranial haematomas who were given early advanced airway care as part of the trauma system built around the helicopter service.[27] The benefit to those exceptional cases who survive cardiac arrest after being stabbed (previously mentioned) is unquestionable. Therefore, if some benefit can be demonstrated, objections must revolve around cost. The cost of providing a helicopter service is phenomenal, with more than just the cost of the aircraft to worry about. Medical helicopter operations are expensive in terms of staffing, requiring highly rated pilots as well as senior doctors, together with a range of safety requirements (e.g. the provision of fire-fighters) and control/operations staff. In Hong Kong, the creation of a Medical Auxiliary section within an existing flying organisation overcomes some of these problems. However, the existing aircraft have the drawback of being multi-purpose rather than dedicated solely to medical work - a situation which may be resolved in the near future with more versatile helicopters.

The perils of prehospital care

There is no doubt that the prehospital environment can be dangerous. Every person, whether ambulance staff, doctor or nurse who chooses to work in that environment must do so with this knowledge. However, it is also true that Emergency departments have their own hazards, which may be no less serious than those faced outside. Cone and

McNamara surveyed all 114 U.S. Emergency Medicine residency program directors, requesting information concerning any accidents in the past.[28] Results indicated that accidental injuries were uncommon but not trivial. One resident died in a helicopter crash in 1985, and a further four received injuries attributable to ground vehicle crashes. Adequate protective clothing to provide cover against potential hazards (e.g. fire,[29] chemical spills) is essential. In situations of civil disorder, initial management of the injured presents special hazards, and Police medical teams may be the most appropriate providers.[7] In some inner city areas, ambulance staff are routinely provided with bullet-proof vests.[30]

The need for research

The urgent need for research in prehospital care is becoming more widely recognised.[31] The realization that findings derived from hospital inpatients and laboratory animals might not be generalizable has led to some useful studies. Two examples are the findings that early defibrillation benefits patients suffering V.F. cardiac arrest,[32] and that patients with penetrating injuries of the trunk do better with rapid transport and minimal prehospital care.[33,34] However, it must be recognised that these are examples of specific situations - asystolic cardiac arrest and blunt trauma patients would not derive similar benefit.

Evidence-based prehospital care is a worthy goal for the future, but it will not be achieved without extensive research by ordinary clinicians and ambulance staff.

Conclusions

It is difficult to draw any authoritative conclusions about the way forward for prehospital care in Hong Kong, so I will have to offer the following comments as my personal opinion.

1. Prehospital care is interesting and fulfilling for doctors and nurses as well as ambulance staff, and combining the skills of all three groups creates a powerful team, particularly in disaster situations.

2. The environment holds some hazards, but these can be managed with prior planning and precautions.

3. The direct involvement of Hong Kong doctors in prehospital care will make them more effective in advising the ambulance service, and more sensitive to the difficulties involved in providing high quality care in this environment.

4. That the best form of paramedic practice involves intelligently assessing every patient, rather than merely following protocols without insight. The ability to decide when to do nothing, and when to do everything, is as important as being able to perform any skill or procedure.

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