PREHOSPITAL CARE

A road traffic accident simulation vehicle for training prehospital practitioners

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Road traffic accidents (RTAs) were responsible for 307 deaths and 2712 serious injuries in Scotland in 2004.[1] The management of these incidents, particularly in remote and rural areas, can involve local general practitioners and nurses, as well as the statutory emergency services. For many prehospital practitioners, attendance at an RTA is an infrequent and stressful experience. RTA management training is an essential component of their safe and effective management. GPs and nurses, unlike the other emergency services, receive no formal education in RTA procedures and extrication techniques in particular. We describe here the development and utilisation of a simulation vehicle for use in immediate care education in both urban and rural settings in Scotland. From April 2004 to June 2005 inclusive, the vehicle has been used to teach 312 medical staff.

BASICS SCOTLAND

BASICS Scotland is a charitable organisation that provides specific courses in immediate care for the benefit of GPs, nurses, and ambulance staff. These courses are provided locally throughout Scotland. As part of the trauma component of the introductory immediate care course, we have traditionally demonstrated the routine extrication of a driver with a presumed spinal injury from a crash damaged car. This simulation entails a considerable amount of organisation, not least the availability of a suitable vehicle and the involvement of local ambulance and fire crews. Other issues also have to be taken into consideration (box 1).

In view of these inherent and recurring difficulties, a decision was made to attempt to source and equip a reusable accident damaged car for the purposes of these extrication demonstrations. It was important to eliminate existing hazards—for the vehicle to offer a realistic scenario and yet also be able to be used again for another scenario within a short space of time. The ability to easily transport and manoeuvre the vehicle from one course venue to another was also essential.

THE VEHICLE

A red 1997 Peugeot 306 was sourced from a local garage. It had previously been damaged in a front nearside collision that had resulted in the activation of the driver's airbag. The modifications carried out on the vehicle and relevant explanations are shown in table 1.

TRANSPORTATION

Once fully assembled, the extrication car weighs 1030 kg. In order to be transported, a fully enclosed double axle trailer was purchased. It includes a winch system and ratchet strap tie down mechanism at the front and rear of the car. The trailer dimensions are shown in table 2.

The total costs of acquiring the car and trailer, modifying the car, and current annual insurance are shown in table 3. Apart from the increased costs of fuel consumption when towing the trailer, there are no other recurring costs associated with the use of the car.

Box 1 Issues relating to the simulation of an RTA for training purposes

- Local garage able and willing to supply suitable vehicle, transport to the venue, clear up debris, and remove vehicle afterwards at a cost of up to £200 per course.
- Availability of suitable area at course venue large enough to accommodate car, emergency services, and spectators without disruption to provision of normal services:
  - hazards generated include broken glass, metal battery acid, and fuel, which must be able to be cleaned up,
  - noise disturbance to venue from cutting gear and vehicles.
- Emergency service crews may get called to live incident before or during demonstration.
- Unwillingness of local emergency crews to engage in the demonstration.
- Lack of uniformity in procedures between crews in different areas:
  - important to ensure learning needs of participants are met.

SET UP

The loaded trailer is positioned at the venue and the car unloaded using the winch. The rear doors of the trailer function as a ramp. Once on the ground the car can be manoeuvred into the desired position. The car's handbrake is still functional and the trailer is then parked separately. Stabilisation chocks are placed under the vehicle.

EXTRICATION DEMONSTRATION PROCEDURE

Although a number of scenarios are possible with the car, our primary demonstration focuses on the urgent extrication procedure. Instructors wearing full personal protection equipment (PPE) act as the attending ambulance crew and/or immediate care practitioner(s). This helps to maintain consistency in the approach to the scenario between courses. The attendance of a fire crew to facilitate casualty extrication is no longer required. Instead, a pre-demonstration slide

Abbreviations: PPE, personal protection equipment; RTA, road traffic accident

Table 1 Vehicle modifications

Modification	Reason
Removal of engine	Reduce vehicle weight for transportation
Drain all fluids	Hazard reduction
All glass removed from windscreens	Hazard reduction and to enable roof removal
All four roof posts cut and sharp surfaces covered. Cut posts filled with expanding foam	Hazard reduction and to enable roof removal
Addition of spring clips to four posts	To enable secure reassembly
Hinges on tailgate and doors changed	To enable tailgate/door removal and subsequent reassembly

Table 2 Trailer dimensions

Overall length with access ramp closed (open)	5.53 metres (18′2)
Width	2.3 metres (7′6)
Height	(8.0)
Trailer weight	830 kg
Weight, including car	1860 kg
Nose weight	150 kg

Table 3 Vehicle costs

Item	Cost
Vehicle acquisition	£800
Vehicle modification	£500
Trailer acquisition	£6633.88
Annual insurance	£85.00

show illustrates their role and the associated manoeuvres—for example, dashboard roll—available to them.

A volunteer is selected from the course participants to act as the injured driver. They are given a full briefing prior to the start of the demonstration and are supplied with appropriate PPE. Once the scenario commences, the volunteer's instructions are to report no symptoms that suggest an immediate threat to life but to indicate the presence of neck and back pain and a lower limb sensory disturbance. The other (observing) participants receive a separate briefing to explain the scenario. Once the casualty and spectators are assembled, the demonstration commences with the arrival of the ''ambulance crew'' and/or GP who carry out scene safety and primary surveys. Manual cervical spine control and oxygen are applied and the seat belt is released. The gaining of intravenous access can be simulated if required for the purposes of administering pain relief and/or medication. Standard patient assessment paperwork is completed and the instructors aim to demonstrate the importance of teamwork and effective communication both between themselves and with the patient.

Once the initial phase of patient assessment and management has been completed, the principles and practice of glass management are now explained to the participants. As the car is glass free, there is no practical demonstration. Following this, roof removal now takes place. This occurs in four stages:

Figure 1 Extrication car.

- Stage 1—the rear parcel shelf is removed.
- Stage 2—the rear hatchback door is removed by way of slide catches.
- Stage 3—the spring loaded clips at each corner post are released.
- Stage 4—the roof is lifted clear of the car.

Once the roof has been removed, urgent extrication can proceed as per the recommendations of the Joint Royal Colleges Ambulance Liaison Committee.[2] A rigid spinal board is inserted into the car from the rear. The seat recline

Table 4 Advantage and disadvantages of the car

Advantages	Disadvantages
1. Financial a. Low set up costs b. Minimal recurring costs	1. Reduced reality a. Lack of emergency services involvement • Reduced noise • Loss of inter-service interaction b. No glass c. ''Dashboard roll'' not possible
2. Administrative a. Acceptable at all venues b. Minimal prior organisation required c. No requirement for attendance of local emergency crews d. Instructors familiar with car set up, function, and operation.	2. Other a. Need for trailer b. Time to assemble c. Car needs to be dried if interior gets wet.
3. Health and safety a. No hazards b. No debris produced	
4. Educational a. Standardised scenario possible b. Instructors maintain complete control c. Multiple variations on scenario possible d. Scenario can be controlled as required (stopped and restarted as necessary) e. Allows production of educational material	

mechanism on the driver's side is still functional, aiding the process. The casualty is secured to the board with spider straps prior to removal from the car. If required, further participants can be selected from the observing group to help lift the driver clear from the car. The demonstration concludes once the driver is removed from the vehicle. A general group discussion then takes place initially concentrating on the scenario itself, then focusing on the volunteer casualty's experiences, and finally finishes with a walk round examination of the car. From the scenario start to the end of the discussion averages 60 minutes. The participants then return indoors to continue the course while the instructor team reassemble the car in reverse and secure it on board the trailer.

DISCUSSION

As far as we are aware, this is the first custom made extrication vehicle to be routinely used on an immediate care training course anywhere in the world. It has significantly improved our efficiency and ability to deliver this component of our immediate care training syllabus. These far outweigh the car's disadvantages (table 4). We can now guarantee the safe delivery of a standardised rescue scenario at minimal cost and inconvenience to both BASICS Scotland and the course venue. In the future, we plan to expand the range of scenarios offered and to produce a set of training videos, which can be used for remote education through teleconferencing facilities.

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