

The Minimalist Approach To Road Traffic Collision Management

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ABSTRACT

The management of casualties involved at the scene of a Road Traffic Collision or Accident (RTC or RTA) is hazardous, challenging and resource intensive. Some pre-hospital care providers work in locations where there is little or no support and where they act as both the rescuer and the medical carer. This paper tries to break down the management of the extrication into key areas in order to suggest how the rescue can, where necessary, be managed with only a small amount of simple equipment.

Introduction

"To simplify complications is the first essential of success."

- George Earle Buckle

Providing medical care at a road traffic collision or accident (RTC or RTA) is a challenging task, for which one must be properly prepared (1). It has its own unique set of hazards and clinical problems which must be dealt with in a structured way to provide the best care for the patient, with minimal on-scene time. This is particularly true where occupants are trapped.

The equipment carried by well developed emergency services allows for an optimal standard of care to be given but there are those carers, such as military medical personnel, who often work in environments where these standards cannot easily be met. This may be because of manning constraint, funding, space and weight limitations, unlikelihood of use, etc. In these circumstances, the medical team may have to act as both carers and rescuers and may have to 'man-pack' all of their kit.

This paper sets out to discuss equipment constraints, a structured approach to RTC management, the most likely and important interventions required, and how the equipment required to support those functions (both rescue and medical) can be distilled down to a few essential items. This is the basis for the 'minimalist approach.' The scenario that the paper uses as a basis for describing techniques is a single car incident with the vehicle on all four wheels, although most of the principles can be applied to more complex and difficult situations and vehicles.

Equipment constraints

The amount of equipment carried by a pre-hospital medical team depends on a huge number of factors. How big is the team? Does the team have a rescue function? Does the equipment need to be person-portable (and by how many)? Are there other space, weight, or hazard constraints (eg. for a helicopter based service)? What is the skill capability of the team and what level of intervention is going to be provided?

An analogy to medical care at an RTC is the tale of Hans Brinker, the Dutch boy who put his finger in the dyke, stemming the flow of water which would otherwise have grown into a torrent and flooded his home town (2). Using his finger was a novel, quick and temporary solution to the immediate problem. In order to repair the dyke properly earth moving equipment was presumably needed with a team of structural engineers and labourers. A full spectrum of hypothetical solutions lies between these two 'fixes' and the answer chosen must be tailored to the overall mission. For the isolated pre-hospital provider, the solution will be closer to the 'finger' end. This paper suggests, however, not just the use of a finger but perhaps the equivalent of a small cork that will allow essential intervention to be done with greater function and at minimal cost. A cork would have saved Hans a very cold night and reduced time to definitive intervention!

Before determining the equipment required, one must first identify the most important interventions that need to be carried out, and which can be done in field. The tools described below are suggested on the basis of simplicity, weight and compactness. By virtue of these features, they also tend to be relatively cheap options.

Safety

Safety comes first. Most systems recommend dealing with safety before assessing, triaging and treating any casualties (3). Safety of the scene, the carer and the casualty should all be considered. The level of safety equipment should depend on thorough risk assessment and be in line with local regulations and policy. Reducing established personal protective equipment (PPE) can only be done at increased risk and should be avoided wherever possible.

Safety issues will not be dealt with further

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but the assumption is made that prior to the extrication these areas have been covered and that the vehicle battery has been isolated where possible. It is also assumed that issues such as scene control and assessment have been carried out, lines of communication have been established, and that triage has been carried out.

Extrication Equipment

It is outside the scope of this paper to discuss the many standard techniques of extrication but it is important to grasp the key stages that are involved so that the 'minimalist' equipment list can be derived. These phases are:

- Vehicle stabilisation
- Glass management
- Space making
- Casualty removal

Vehicle Stabilisation

Stabilisation is carried out to prevent any movement of the vehicle during the extrication and its subsequent impact on spinal injury or clot stability. Vehicles are usually stabilised with wedges, blocks or stepped chocks. Chocks are placed near jacking points adjacent to the four wheels with the weight of the vehicle resting on them (by lifting each wheel arch in turn and placing the chocks underneath).

Improvisation can be carried out using materials such as thick pieces of wood, concrete, sandbags or spare wheels. Care must be taken to ensure suitable strength of each support. If necessary, tyres can be let down to help the vehicle to 'settle' onto the chocks. This should be avoided where possible though, as it becomes problematic for any subsequent crash investigation (ie. tyre pressure measurement).

Figure 1 shows a vehicle chocked with two spare wheels. Note that the top wheel should ideally have been placed further underneath for better stability.

Glass Management



Fig 1. Improvised vehicle chocking.

If any metal cutting techniques are to be used (eg. roof removal), the vehicle's glass should be managed first. Where possible, the rubber around the glass should be removed (typically front and rear windscreens) and the pane



Fig 2. Window punch positioned ready to fire.

lifted out intact, but this is not often possible with newer vehicles where glass tends to be bonded into its frame.

Side windows usually need to be broken, although they may be simply wound down into the door; consideration should still be given to breaking the glass inside the door where it will be caught, rather than leaving it intact where it might shatter uncontrollably at a later stage with door movement or cutting.

Where glass needs to be broken, great care must be taken to protect the casualty inside using PPE wherever possible to include head, eye and respiratory protection if possible as well as improvised shielding – holding a piece of carpet, cardboard or similar as a wall between the casualty and the glass will allow the deflection of broken pieces.

Side and rear panels of glass can usually be broken with a hard metal point, such as by striking sharply with a broken hacksaw blade. Time, effort and control can all be lost by trying to break through a window with a heavy blunt object such as a hammer. For better control, an automatic centre punch or a specifically designed window punch can be used (Figures 2, 3 and 7).

Front windscreens are laminated with plastic layers that are tough and if the windscreen cannot be lifted out as a whole,



Fig 3. Window punch firing. (Glass would be better controlled if window could be wound down into door before firing).

the glass will need to be cut, usually low down and horizontally. Many tools can be used to achieve this, including the following:

- DIY wood saw (very effective)
- Folding pruning saw (effective and compact)
- Garden shears

- Axe, machete, ice axe
- Halligan bar

Of those listed above, the folding pruning saw is probably the ideal tool for the 'minimalist' rescue kit being light, compact, cheap and effective.

Space Making

Deciding how far to go with cutting techniques is important and is based on several factors including the degree of entrapment, the nature of injuries, the type of vehicle, and the criticality of speed of release.

The most common cutting technique used for the controlled extrication of a casualty is roof removal. If there is a high risk of spinal injury, roof removal will allow the casualty to be lifted out in a longitudinal direction, usually on a spinal board. This may be done even if the casualty is not physically trapped and may be preferable to a 'snatch rescue' through the side door where there is far less control of the spine.

The roof is removed by sawing through its supporting posts. Conventionally, the last post to be cut is the one nearest the trapped casualty in order to maintain structural support above their head for as long as possible. Before cutting the posts, ensure fascia is removed from the inside of the posts to make cutting easier, to expose any 'easy' routes for the saw blade and to identify any safety devices such as airbags or curtains which should not be sawn through! This is best achieved with a 'jemmy' bar (Figure 7). Seatbelts and anything that might tether the roof once the pillars are cut also need to be removed in advance. The posts can be cut through with a hacksaw in as little as 10-15 seconds (Figure 4). It is important that the hacksaw is of heavy duty construction, that high quality blades are used and that spare blades are carried in the rescue kit.

Once the roof is removed, there is generally much better access to the patient and further space making cuts may not be needed. Other techniques can be used depending on the degree of entrapment, the ability to cut the metalwork of the vehicle, the tools available and the improvisation of the rescuers. It cannot be overstressed that the use of effective analgesia will save a lot of time and difficulty by allowing fractured limbs to be



Fig 4. 'B post' being sawn through by hand (10 seconds).



Fig 5. Seatbelt being used to bend accelerator pedal to one side (space making).

carefully manoeuvred out of the wreckage without the need to cut further. Indeed, analgesia could be considered as a key conceptual item of rescue equipment.

Seatbelts can be recycled and used as strops such as for bending pedals out of the way, using the door for leverage (Figure 5).

Other techniques can be carried out with vehicle lifting jacks or hand winches, again depending on the improvisation of the rescuer. Even with simple equipment, a great deal of space can be made, as shown in Figure 6, achieved within 20 minutes.

Casualty Removal

Once the casualty is free from physical entrapment and ready to be moved, a spinal board is the preferred method of extrication from the vehicle. A spinal board is an excellent tool but a suitable device can sometimes be improvised depending on materials available.

The Rescue Kit

Derived from the phases above, Figure 7 shows the suggested 'minimalist rescue kit' for vehicle extrication. The multi-tool should contain a good blade and pliers which both have multiple uses. Missing from the illustrated items are spare hacksaw blades and PPE. The window punch shown (the RES-Q-ME™) has a built in seatbelt cutter.

Medical equipment

The focus of this paper is on extrication equipment, but medical equipment can also be reduced to the bare minimum where necessary. Equipment should meet the tasks likely to be faced and match the skills of the operator. The circumstances where an individual may wish to carry a 'minimalist trauma kit' might include carrying equipment in his or her vehicle for the infrequent 'good



Fig 6. The end-result of a manual-tools-only extrication exercise – achieved within 20 minutes.



Fig 7. The 'Minimalist Rescue Kit.' (Items not all to scale).

- 1 - Window punch / seatbelt cutter
- 2 - Multi-tool
- 3 - Folding pruning saw
- 4 - 'Jemmy' bar
- 5 - Robust hacksaw

Samaritan' act at an RTC. Few commercial 'first aid kits' contain the equipment needed by a skilled provider to carry out life saving intervention – individuals should consider making their own kit, tailored to their own needs.

The following is only a suggested list, based on interventions that can be carried out as life or limb saving procedures:

Airway

1 x 6.0mm nasopharyngeal airway.

1 x 7.0mm nasopharyngeal airway.

These will cover most adults' sizes (4). Consider adding oropharyngeal airways depending on local policy. There are some cases where nasopharyngeal airways having been placed intracranially (5), but these appear to be rare – caution must however be taken when placing these adjuncts in the presence of head injury.

Surgical airway kit

eg. skin preparation swab, cuffed 6.0mm tracheostomy tube with ties, syringe, scalpel, small pair of forceps.

Cervical spine immobilisation

High quality manual in-line stabilisation alone, unless space available to carry an adjustable collar.

Breathing

2 x 12G or 14G iv canula (eg. Medicut™ for decompressing tension pneumothorax (possibly bilateral, hence carrying two).

Pocket mask – ventilation.

Circulation

Field dressing.

Tourniquet.

This kit fits into a typical small first aid box, yet allows airway support, ventilation, treatment of tension pneumothorax and control of life threatening compressible haemorrhage.

Discussion

"Strength lies in improvisation. All the decisive blows are struck left-handed"

- Walter Benjamin

"Things should be made as simple as possible, but not any simpler."

- Albert Einstein

The provider of pre-hospital care may not always have the luxury of gold-standard equipment. In these circumstances, he or she must identify the key interventions (medical or otherwise) that will optimise the casualty's care and then establish how those interventions can be carried out. Being able to improvise with locally available materials and tools is critical to success. Practical ability, particularly with minimal or improvised equipment, can be greatly enhanced by appropriate training (6).

When putting rescue or medical equipment together, there is often a tendency to duplicate equipment, to carry more than is needed for the 'what if' scenario or simply to make users feel more comfortable. The result can be that so much equipment is carried that the process of care becomes inefficient because of clutter. At the other extreme, there is the danger of reducing equipment levels beyond the 'minimalist' to the 'inadequate,' hence the need for balance.

Finally, the minimalist approach also has some relevance to the pre-hospital provider in a well resourced system. By conceptually reducing the casualty's management into critical interventions and the equipment required to support each of those, the clutter of the scene can be lessened, delivery of care may be made more efficient, and time on scene may be reduced.

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Conflict of interest

The author is course designer and director of the Defence Medical Services' Road Traffic Accident Medical Management (RTAMM) course.