

Thinking of Setting up an Ambulance Referral System?

When setting up an ambulance referral system in a rural environment in low income countries there are many factors to consider. Often many obvious things are sometimes over looked. We have put together some basic points which we have learnt over the many years of supplying eRangers into the field. The information below is by no means definitive but we hope it will be useful to those contemplating setting up a referral system.

The items below are in no particular order but are all relevant for structuring a sustainable system.

Funding

Having made the decision to implement a referral system are you in a position to fund the project for the duration of the project. You will have found out the unit cost of your mode of transport but have you planned for the cost of running that particular mode. Certain costs would be minimal such as a basic stretcher, and others will be extremely costly. For instance, 4x4 type vehicles.

Running costs on motorised ambulances will include fuel cost. This inevitability will rise during the duration of the project and the increases should be factored in. Another very important factor is the maintenance, service and repair costs. These costs should be established prior to commitment of a particular vehicle. Even Pack animals have a running cost in terms of food and veterinary charges and so on.

If a program is planned for many years a replacement vehicle / mode cost should also be considered and budgeted for. Staff and driver costs must be established, it can be very cost effective to utilise current staff which are already on the pay roll when based at a health centre or clinic. A dedicated ambulance driver on a separate salary for a motorised vehicle is probably not the best option. The main reason for this is the fact that it would be highly likely that the driver may not have referrals on a regular basis, sometimes two or three days is not unheard of, but would still expect, quite rightly, payment for his or her standby services.

Appropriate mode of Transport

Utopia would be a fully equipped motorised developed world type ambulance, with full life support running on smooth tar roads, but reality must prevail and we have to look at what is appropriate for the environment that you intend to run your system in.

The biggest problem is to be able to deal with the terrain in your project area; this should be researched fully prior to your choice of transport. It may well be that a combination of modes are required to produce an effective referral system. An effective system is one which can give the quickest referral time. There is little point in thinking that just because a 4x4 vehicle can achieve speeds of 140 kph on a good tar or graded road it alone will be the answer. In hilly areas with narrow tracks with boulders it is very unlikely that any form of motorised transport would manage to get to its final destination and certainly not without risk to the driver and medical staff.

In this instance it would be appropriate to furnish the community at the end of the track with a stretcher of some format to porter the patient to the nearest point of collection with a faster mode of transport for onward passage to the health centre or clinic.

There are numerous options available for rural deployment but a certain criteria should be followed for motorised vehicles. The vehicle should have adequate ground clearance and large diameter wheels, this will assist it dealing with undulations and pot holes etc. The tyres should be of an aggressive tread pattern to deal with loose surface conditions as well mud sand and rocks.

The suspension should be adequate to deal with continuous undulations in the road surface. The power of the engine should be suitable to deal with climbs and extra load when driving through mud and sand. The overall size and weight of the vehicle should be considered. The lighter the weight the easier it will be to extricate from muddy or sandy conditions, the smaller the size will enable it to pass on narrow tracks and give it greater ability to manoeuvre around obstacles. Both of these attributes will assist in loading onto small craft or rafts to traverse water sections.

The safety and comfort of the patient during referral is extremely important and serious consideration must be given to the level of provision made by the selected vehicle. The vehicle should have the ability to transfer the patient in both a prone and seated position, as well as good protection in the event of an accident or rollover.

There are numerous motorised variants which may conform to the above criteria. These can be broken down into Cars and Light trucks, Motorcycles and adapted derivatives ,three wheelers and variants such as Tuc Tuc's, and one off conversions.

If we look at the variants in more detail, this may be of use during the selection process for the most suitable application for your project.

Off road 4x4 and 4x2 vehicles are a well known workhorse of developing countries and in the main they fill the criteria for operating in hostile conditions. However they are very expensive to purchase with very high running costs per KM. Due to their high costs it would not be prudent to base this type of vehicle in a rural environment. If funding is available it may be better to base this type of vehicle at a hospital to be used for a higher level of referral from health centres or clinics.

Motorcycles are very efficient at covering poor terrain, very common and the running costs are very low. Their ability to transport the sick or infirm is very limited and normally requires an additional pillion passenger to support the patient. This can lead to instability and a higher risk of an accident. At present, we at eRanger are developing a special adaption for a solo that will have the ability to transport a high percentage of patients with greater stability and safety.

Motorcycle variants and adaptations can be constructed to produce a very cost effective platform for patient transfer. When we at eRanger decided to address the problem of rural patient transfer we studied all options and chose to use an adapted motorcycle as the motive power for the ambulance platform. A sidecar combination was found to have the best attributes. By addition of the sidecar the instability of a solo machine is ruled out as the vehicle, instead of a single track, becomes a twin track. By mounting the sidecar directly to the motorcycle frame extra strength and durability is achieved. The mounting of the sidecar enables the platform to carry a patient in a prone position without increasing the overall length of the motorcycle, and the width is only increased by approximately sixty percent of the solo machine. The running and maintenance costs are approximately ten percent more than a solo machine; inevitably the purchase price is higher than a solo machine as a lot more equipment is supplied.

Other adaptations were investigated such as trailers attached to the motorcycle. It was found during testing to be extremely difficult to drive over poor terrain with any degree of confidence due to a high level of instability. When a trailer is attached to a motorcycle the vehicle combination becomes a three track vehicle which is also articulated. Single wheeled trailers were also evaluated but even more instability was noted. In most developed countries it is illegal to transport humans in the trailer of any form of articulated vehicle. It should be noted that many low income countries are adopting road traffic laws from developed countries, and it may be illegal in the area that you intend to structure a program to utilise a trailer system. Serious consideration should be given before implementing a system utilising motorised trailers of any format.

Three wheeled variants also known as Tuc Tuc's are very common in urban areas of low income countries and are very effective in this environment. Although, as soon as they are operated away from tar type or well graded gravel tracks, their ability to be effective is greatly reduced. The main reasons for this are low ground clearance, small wheels, the unavailability of suitable tyres, and low power to weight ratio, weight and overall dimensions. From feedback and numerous reports they also require a higher than normal level of maintenance. All these factors coupled with a three track vehicle make them very difficult to operate in poor terrain.

Non motorised modes should be considered as part of the system in difficult to reach areas, these can comprise of Pack animals, basic properly constructed stretchers and bicycle trailers. All of these have a part to play if an effective referral system is to be implemented. Areas of difficult terrain such as hilly or mountainous regions may well benefit from the use of Pack animals. The use of stretchers of various formats such as a single wheel type as well as normal hand held, must also be considered as part of the system. There is a great deal of promotion regarding bicycle ambulances which is a trailer pulled by a bicycle. This type of transport has been found to be effective in good flat terrain within close proximity of a health centre or clinic, but distances above 8km and poor terrain conditions such as soft sand and mud make them very difficult to function and to give a fast referral time. Never the less this mode of transport is worth consideration as part of the system, allowing the motorised ambulance to be freed up for referral at greater distances from the health centre.

Management

We have found that without robust management throughout the program and particularly at health centre level, the system will soon fail to be effective. The Management Team at the health centre should be responsible for appropriate instructions for deployment of the drivers, even to the point of handing over the keys to drivers prior to a referral or other trip approved by the management. This should alleviate any form of abuse of the vehicle. The responsible person should also ensure that log sheets are kept up to date. Log sheets are a vital tool for data collection, not only for the vehicle but also for patient records. Without this information you will not be able to determine if your program is effective or not. Other responsibilities will include ensuring adequate fuel supplies for motorised vehicles, log sheets will also help with arranging predictable service and maintenance for the vehicles. Other duties will be fairly obvious, for example ensuring driver payments are on time.

Working with your community

This is an area of great importance. Without co-operation of the local community all sorts of barriers may appear. By involvement the community have a sense of ownership and will be very happy to assist in any way they can. They can act as advocates for the program, assist in road and track improvements to make access to villages faster, self monitor vehicle abuse and even fund fuel costs. All of these plus many more interventions from the community will add to the effectiveness of the system. Any dialogue should be carried out prior to deployment of the selected mode of referral.

Training and maintenance

As with anything that is mechanical training of how to use correctly and keep it in a fully functioning condition is of paramount importance, even a wheelbarrow requires maintenance. There is no such thing as a maintenance free mechanical item. There are claims that if you opt for a service contract your vehicle will never breakdown; this is similar to a claim that if you visit a doctor on a regular basis you will never become ill, only to be bitten by an insect the day after visiting the doctor and suffering a blood infection.

To mitigate these problems correct training is important. The correct training of your drivers in road craft, patient safety and basic maintenance of the vehicle will pay dividends throughout the time span of your project. Your vehicle supplier should be able to supply information on how to keep your purchase up to standard. This may be in the form of handbooks or by direct hands on education.

Daily inspections prior to use should be carried out, this would include all safety related items such as braking systems, steering, tyres and lighting, plus engine checks for oil and fuel level and leaks. Also, water levels if applicable. Regular service intervals as listed by the vehicle manufacturer should be carried out, log sheets if correctly monitored will show when service is required.

It is advisable to carry a level of spare parts at the vehicles base along with a set of appropriate tools to carry out any small repairs. If the driver has the ability through correct training to carry out repairs at the vehicles base, this would be of great benefit as it will reduce down time of the vehicle. In the event of repairs being unable to be effected at the vehicle base, prior arrangements should be made for sub contracted engineers to carry out repairs.

Deployment Expectations and limitations

Having made the decision to deploy a referral system, what are your expected outcomes? If your program is rural based at a clinic or health centre, do you know the total catchment area? This will include the maximum distance from the clinic and population density. The transport mode should be capable of reaching the extremity of the catchment area within an appropriate time to make referrals effective. Indicative maximum safe speeds over poor terrain are in the region of 20/30kph, and this should be factored in. There would be little point if your mode of transport cannot travel at a reasonable speed to reach the extremity of your catchment within a predicted time. For example, a patient with severe blood loss located some 30Kms from the clinic should take approximately three hours to refer provided your transport mode can achieve indicative poor terrain speeds, even with this speed for the distance the outcome for the patient with blood loss would probably at best be dubious.

In order to obtain fast referrals you first need to be aware of a problem, to this end communication to the health centre is the first part of the process, any delay in this will have an effect on the outcome of the patient. To address this, a system of communication must be adopted. With the ever expanding cellular phone network in low income countries, setting up a system in villages by providing a cell phone to a responsible person in the community can reduce referral time dramatically. In the event of poor or no cell phone reception in a particular area, an intervention such as a bicycle can be used to good effect. The bicycle can quickly reach an area where cell phone reception is available or can be used to contact the health centre directly. As mentioned in the community section, dialog will be very useful in structuring a communication system.

We are often asked if we can fit additional medical equipment to eRangers, such as oxygen bottles. Whilst this is not an unreasonable request, if it is looked at in a practical manor it is really not an appropriate addition. There are many reasons, such as the size of the bottle required for administering oxygen during a three hour trip. This would take up most of the space for the patient, and what, if any arrangements have been made to refill the cylinder when empty and is funding in place to cover rental costs of the equipment? Another request is for the supply of IV bags; this is another reasonable request but once again could be deemed inappropriate unless the vehicle operator has been trained to give invasive surgery. This leads to the subject of what level of medical training is given to the ambulance driver/ medic. This is an area which should be looked at in detail by the program manager, but we feel that as a minimum all drivers should be educated to a level of a first responder capable of basic life support.

Free at point of use?

If a referral system is funded by a government the expectation of local communities is that it should be free at point of use, where as a program funded by an NGO large or small, the community is less reluctant to contribute to the cost of running the program. The decision to charge is one that you will have to determine based upon your ethos and budget. If a contribution for transport is to be made it must be seen to be fair and reasonable, and if possible with exemptions, for example, pregnant women and the under 5yr olds. The charges if imposed must be affordable, a few dollars US per trip would probably be acceptable and would be able to be funded through contributions via the patients' extended family. On the other hand, if the charges are high, for example, \$10 USD per trip you will probably find that there is a greater reluctance to utilise the service with the inevitable consequences. There are various options available for a community based funding scheme. If you consider the numbers in the catchment area, and as a rule of thumb this would be in the region of 25,000 to 30,000 per health centre or clinic, this could represent something like 5000 families. If it was possible through a community system to collect 25 cents USD per annum per family this should cover most of the running costs for something like a motorcycle ambulance. If a 4x4 type vehicle is deployed the contribution required could rise to somewhere with the region of \$1.50 to \$2.00 USD. Once again this is somewhere that dialog with community leaders could be of benefit. The charges would only need to be considered for motorised forms of referral.

Point of referral

There is little point in implementing a referral system if the facilities at the point of referral are not up to a reasonable standard, and do not have the capacity to deal with the extra workload

generated by an effective referral system. This must be the first consideration prior to implementing any form of system.

We hope this information will be of use to those contemplating structuring a referral system. If you feel we can assist you further in any way please do not hesitate to make contact with us a eRanger via email at

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