Securing transport incubator systems into ambulances

Infant Transport Securing Systems are now seen as an essential part of the safe ambulance movement of patients.

ParAid Medical Systems "Tite-on" transport incubator securing system addresses this issue and we review its performance during patient transfers.

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The safe transport of incubators in road ambulances requires consideration to be given to their security within the vehicle. This guide will look at a solution to the problem of fixing transport incubators into ambulances – the 'Tite-On' Transport Incubator Clamping System.

BACKGROUND

The Scottish Neonatal Transport service undertakes around 1200 patient transfers each year[1]. This integrated service is organised as three regional networks. The Southeast regional team is based in Edinburgh and covers an area stretching from the Scottish Borders to the Kingdom of Fife. The team utilises ambulances and crews provided by the Scottish Ambulance Service (SAS). When a vehicle is requested, the SAS will provide any ambulance from their pool of 'frontline' vehicles, which are equipped for accident and emergency work and therefore not specifically designed for neonatal transfers.

The Transport Incubator System (TIS) is essentially a mobile intensive care unit for the infant (*FIGURE 1*). Mounted on a trolley, it includes all the equipment needed to provide a similar level of care to that available on a neonatal intensive care unit and is capable of operating for a limited period of time from its own gas and power supplies. A British/European standard (BS EN 13976-1) restricts the weight of the TIS to 140kg. A further standard (BS EN 1789) is relevant to their fixation in road ambulances. The standard states that the securing method should be capable of withstanding deceleration forces of 10G in five directions. This is roughly equivalent to the deceleration felt by an object coming to a stop from a speed of 30mph in a distance of 3 feet, or an object coming to a stop from 60mph in 12 feet.

THE CHALLENGE

The 30 vehicles in the SAS Edinburgh fleet have a range of different internal layouts, reflecting a spread of vehicle ages and manufacturers. There are several different stretcher types in use, and various corresponding stretcher fittings. Wall mounted 'York 4' type fittings were not designed to take the weight of a TIS and will not provide sufficient security to deal with the forces applied in the circumstances of an accident[2]. More modern floor-mounted stretcher securing devices may perform better, but require dedicated trolley bases which would restrict the number of ambulances which could be used for neonatal transport.

FIGURE 1. A transport incubator system.

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Although dedicated vehicles have benefits, not least of which is the ability to provide a dedicated fixation system, it remains an advantage to be able to use any vehicle in the ambulance fleet for times when the dedicated vehicle is out of action, or when the number of simultaneous transports exceeds the number of dedicated vehicles.

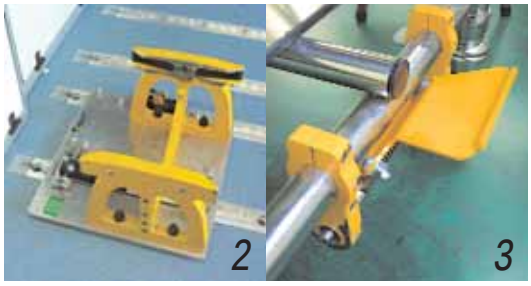
Historically, the standard York fitting was used regularly by the neonatal transport team. As newer vehicles arrived on the fleet, the position of the fitting was no longer suited to the incubator trolley. Working with colleagues in the ambulance service over several months, the best available solution appeared to be modified ratchet wheel-chair clamps and this became the accepted method of securing TISs into ambulances in Southeast Scotland. These were untested in terms of loading, and in all likelihood were operating beyond their design limits. They were awkward to use, time consuming to fit and prone to malfunction. The challenge was to find a method of fitting any Scottish TIS into any vehicle in the SAS fleet. The fixation system needed to be simple and safe to operate whilst conforming to the relevant standards.

THE TITE-ON SYSTEM

The Tite-On floor fixation system (Paraid Ltd., Birmingham) has been designed and manufactured to allow safe and easy securing of incubators in the ambulance during transfer. The system consists of two detachable floor units which secure into the ambulance floor and two pedal units which are permanently attached to the ends of the incubator trolley (*FIGURES 2 & 3*). The system meets tilt and impact requirements specified in BS EN 1789.

Each TIS is fitted with a foot pedal at either end of the trolley. Pins on either side of each pedal lock into the floor units. To release the trolley, the pins retract when the pedal is depressed (*FIGURE 4*).

The Tite-On system was initially introduced into Scotland with the purchase of a dedicated vehicle for the West regional team. It was assumed that the same locks could be used in any ambulance since the floor units make use of the 'Unwin' type tracking for fixation – metal strips set into the ambulance floor which are used for securing wheelchairs. However, in reality, the spacing of the tracking, and the alignment of the holes varied significantly between vehicles. The manufacturers, the Southeast team and the SAS proceeded to work together over a two year period to adapt the original system to be fixed into any vehicle. Paraid re-designed the floor units with a small tolerance to allow for ambulance tracking variations and around a dozen older ambulances were fitted with new lengths of tracking.



FIGURES 2 AND 3. The Tite-On floor unit and pedal unit.


FIGURE 4. Releasing the trolley.

TRIALS, EVALUATION AND EDUCATION

The Southeast regional team agreed to trial and evaluate the Tite-On fixation system, in collaboration with the SAS, Paraid and local hospital engineers. Paraid supplied the transport team with two ambulance-sized lengths of tracking mounted on a wooden base to represent an ambulance floor. This allowed the transport staff to practise fitting and removing the floor units before using the system in fleet vehicles. The TIS was then fitted into each make and model of vehicle and the location of the floor units was recorded.

When an ambulance arrives for a transfer, the team members check the ambulance make and registration against a list which tells them where to locate the floor units. The TIS is loaded into the ambulance using either the tail-lift or the winch and ramp, depending on the vehicle configuration (*FIGURE 5*).

Fitting the floor units often requires removing existing stretcher restraining devices. The bolts holding these items in place are often stiff through lack of use; a wrench has been purchased to assist the ambulance crew in removing them. Installation of the floor units can take a few minutes – this is usually quicker than fitting the old ratchet clamps and since the floor units are installed before the incubator is loaded into the vehicle, there is plenty of space to work in. The benefit of the system is that once in place they can be left for the return journey. For a team leaving its base to move a baby between two outlying hospitals, then returning to its base, the time

saved in struggling with alternative fixation methods is significant. After initially bending down to fit the floor units, the user only has to operate a foot pedal each time the incubator needs to be released. This is an improvement in terms of manual handling.

When undertaking transfers outside Scotland the team has, on occasion, had to use vehicles which do not have compatible tracking. Therefore the ratchet clamps are still carried as back up if transferring a baby into England, in case of ambulance breakdown.

As the evaluation period progressed, the transport team staff and hospital engineers were in regular communication with the manufacturers. Over a period of six months several minor modifications were made to the design as a result of feedback from the users. As confidence with the equipment grew, the transport team and the SAS made an educational video which is to be distributed to ambulance stations so that all crews can be familiar with this type of fixation.

FIGURE 5. Loading an incubator system using a tail-lift.

CONCLUSION

The partnership between SAS and the Scottish Neonatal Transport Service was vital to the progress of the project. Developments only proceeded because safety was a priority, shared jointly between the transport team and the ambulance service. The final responsibility for securing TISs into vehicles could be argued to rest with the ambulance service, however in practice a team approach is most likely to be effective.

The introduction of the new European Standards is a matter that all transport personnel and services should be aware of. Any organisation or individual failing to follow these regulations will be culpable in the event of an accident[3]. Employers have a duty of care to their staff, and to the safety of their patients. Ignorance is not an excuse and the days of improvised fixation systems should be numbered.

The modifications made to stretchers to convert them into paediatric retrieval trolleys are relatively unregulated especially when compared to the new regulations covering incubator systems[4]. The Tite-On system can also be fitted to paediatric retrieval trolleys to provide secure anchorage for these pieces of equipment (*FIGURE 6*).

FIGURE 6. A paediatric retrieval trolley with Tite-On foot pedal.

FURTHER THOUGHTS ON SAFETY

The fixation of the TIS into the ambulance is only one aspect of restraint-related safety that should concern users of transport services. Steps should be taken to ensure that the staff and patient are adequately secured with appropriate restraining devices. The patient in particular should not be overlooked; the availability of a safe and suitable harness for use in neonatal transfers is an outstanding issue for many transport teams.

Unrestrained equipment can also become a lethal missile in the event of an accident. Injury from the process of transport should be preventable to a large extent, and transport teams should strive to make this environment one that adds to the patient's care, not one that potentially places the patient and staff in danger[5].

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