

PARAMEDIC HELICOPTER RETRIEVAL OF TRAUMA PATIENTS

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We read with interest the paper by Cameron *et al.* We would like to congratulate the authors on producing this paper; however, it is our opinion that the conclusions reached are not supported by the data. Specifically, we would make the following points.

The authors state that four cases only were identified where prehospital management could have been improved. However, they state that 25 patients with a Glasgow Coma Score of 8 or less were transported unintubated, and a further 16 patients required intubation upon arrival at hospital. The inexorable conclusion is that prehospital management was inadequate in at least 41 patients (16%) on airway criteria alone.

A total of 57 patients had insertion of intercostal tubes uni- or bilaterally on arrival in the emergency department, of whom only 15 had had needle thoracostomy on scene or in transit. The remaining 42 patients (16.5%) were therefore transported by air without drainage of presumed pneumo- and/or haemothoraces.

Twenty-six patients received massive colloid and crystalloid infusion of more than 3000 and up to 6500 mL, without institution of blood products. This represents from 60 to 130% of total blood volume in an average (70 kg) individual, with consequent potentially deleterious effects on tissue oxygen delivery, and the increased risk of coagulopathy, adult respiratory distress syndrome (ARDS) and related problems.

Without reviewing individual cases, it is impossible to know how many patients fell into more than one of the above categories. However, the total number of patients in whom prehospital management could have been improved (by the use of more skilled airway management, appropriate insertion of intercostal tubes, and use of universal donor blood where indicated) would therefore seem to lie somewhere between 42 and 109 (16.5–43%).

We contend that these patients would have been far better served by the despatch of a team based around at least one appropriate medical practitioner, such as intensivists, emergency physicians or anaesthetists. Such practitioners are experienced and capable in elective relaxant assisted intubation, placement of intercostal catheters, and a wider range of fluid resuscitation options than

paramedics, including administration of blood products. The use of physician-based teams aboard medical rotorcraft for scene response has been deemed necessary or associated with improved outcomes in a number of studies.^{2–5} Even in other studies that do not demonstrate an improved outcome with physician staffing, the non-physician groups consist of critical care nurses certificated to a procedural level much higher than paramedics, and working under on-line physician control by radio.^{6,7} Scene response by medical staff enables much earlier institution of definitive therapy in many cases, particularly in head injury patients where the majority do not have a neurosurgically amenable lesion.⁸ Improved outcome has been demonstrated in head injury patients by the institution of advanced measures by helicopter borne physicians despite longer prehospital times.⁹ The use of physicians responding via rotorcraft to severe trauma at scene, has been shown in Germany to be both practical and cost-effective.¹⁰ By contrast, the use of paramedic staffed rotorcraft offering in an urban environment has been shown to provide no outcome enhancement over paramedic staffed road transport.¹¹ Unless figures available to the authors for patients transported by road to the same centre show a survival significantly worse than the Major Trauma Outcome Study cohort,¹² then this study is consistent with the aforementioned earlier one¹¹ in showing the cohort of patients studied to have no significant improvement in survival over that expected. In this case, the value of paramedical (as opposed to medical) helicopter scene response must be regarded as questionable.

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PARAMEDIC HELICOPTER RETRIEVAL OF TRAUMA PATIENTS: REPLY

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would like to thank Drs Munford and Manning for their comments; however, their views as expressed in the letter are not supported by clinical practice or by the articles that they quote.

In our study, 25 patients were identified with a Glasgow Coma Score ≤ 8 on arrival at hospital who were not intubated prehospital, and a further 16 required intubation after arrival. The conclusion that 41 patients had inadequate airway management prehospital takes no account of the fact that the conscious state frequently changes en route, and that some difficult intubations are better delayed for 10-15 min until they reach hospital, so that they can be performed in a controlled environment, and that some 'emergency intubations' are in fact semi-elective, or control of analgesia, for example. In our article we state that some patients may have been intubated earlier, if the paramedics were able to use muscle relaxants, although the use of muscle relaxants prehospital has not been shown to be associated with improved outcome.

The fact that 57 patients had intercostal tubes following arrival at hospital does not mean that these tubes should have been placed prehospital. One patient had an unrecognized tension pneumothorax; no other patients appeared to suffer from delayed definitive tube placement. There is no evidence that placing definitive intercostal catheters prehospital under less than ideal conditions improves outcome.

The argument that 26 patients had 3-6.5 L of fluid without receiving blood products represents poor treatment does not take account of certain practicalities. Transfusing uncross-matched blood prehospital has its

own problems, including storage and rapid infusion. For this small number of patients requiring massive transfusion, it could be argued that the provision of two units of blood would make little difference, and in fact delay transport to definitive surgery, thus increasing complications. The association of haemodilution with adult respiratory distress syndrome and coagulopathy has not been established and is open to debate.

The arguments raised by Drs Munford and Manning relate to the perennial debate of 'scoop and run' versus 'stay and play'.^{1,2} The paramedics in the service we have described are taught procedures that are immediately life-saving and must be performed to get the patient to hospital alive. The letter criticizes the service for not providing access to more complicated procedures, such as blood transfusions, formal insertion of an intercostal catheter, and intubating patients with muscle relaxants when they have a competent airway and adequate oxygenation. There is a growing trend in the current literature to suggest that the most important determinant of outcome in patients with penetrating trauma and ongoing bleeding is the time that it takes the patient to get to theatre, and that transfusion before definitive surgery may in fact be harmful.^{3,4}

The proposition that physician-based teams for scene retrieval by helicopter improves outcome is not supported by the studies quoted.⁵⁻¹⁰ Only two of the studies compare outcomes between equivalent groups in a controlled fashion, and the conclusions differ.^{5,6} Indirect evidence suggests that physicians do not improve outcome.¹¹ The impact of physicians on outcome would be expected to differ according to the group with which they were compared, that is, an emergency medical technician (EMT), an ICU nurse, or paramedic with advanced protocol. There is no definitive study in this area.

Drs Munford and Manning correctly state that a par-

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amedic-staffed helicopter offers no advantage over road transport paramedics in the urban environment; however, this is not relevant to our study, as this service was largely a rural retrieval service.

The final suggestion that a comparison should be made with trauma patients transported by road using the Z statistic, is not appropriate, as the two groups are obviously different. The majority of patients in our study were transported over long distances, and the average turn-around time was 80 min. If seriously injured patients from geographically remote areas had outcomes similar to those with equivalent injuries occurring adjacent to a trauma centre, then the paramedics would be performing very well.

In the article, we stated that improvements in protocols and better supervision may result in some improvements to the service. Since this article was written, improved medical control has been developed. The value of all advanced life support (ALS) procedures prehospital, needs to be continually reviewed and the influence of physician or paramedic-based helicopter services needs to be continually reassessed with respect to cost versus benefit. For the small number of seriously injured patients requiring physician as opposed to paramedic protocol-based intervention, it is unlikely there would be a significant difference in outcome.

Finally, it is important to differentiate between primary and secondary transport. Our study related only to patients transported from the scene and not to patients transported between hospitals. The principles of rapid transport with minimum intervention do not apply to secondary transport.

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