Health Technology Assessment 1998; Vol. 2: No. 17 (Executive summary)

Executive summary

The costs and benefits of paramedic skills in pre-hospital trauma care

Jon Nicholl[1]
Sue Hughes[1]
Simon Dixon[2]
Janette Turner[1]
David Yates[3]

[1] Medical Care Research Unit, University of Sheffield, Sheffield, UK
[2] Sheffield Health Economics Group, ScHARR, University of Sheffield, Sheffield, UK
[3] University of Manchester, Hope Hospital, Manchester, UK

With contributions from:
Study design: Helen Snooks, John Brazier
Data collection: Tricia Myers, Kate Cleary, Kate Harrington
Avoidable death assessment: Chris Carney, Tom Clarke, Matthew Cooke, Howard Sherriff, and Tom Judge

Health Technology Assessment
NHS R&D HTA Programme

Executive summary

Executive summary

Introduction

It is Department of Health policy that all emergency ambulance crews should include a paramedic trained in advanced life support. In addition to the training in basic life support (BLS) that all ambulance crew receive, training in the UK usually consists of 8 weeks of instruction and practice in endotracheal intubation, cannulation, and the administration of intravenous fluids and a limited range of drugs. This study assessed the effectiveness of the additional paramedic training in the management of serious trauma.

Methods

Main non-randomised cohort

Cohorts of patients attended only by ambulance service crews with BLS training (emergency medical technician [EMT] cases), or by crews with at least one paramedic were sampled over a period spanning 21 months from July 1994 to March 1996 from three ambulance service areas. Patients with serious trauma who died or stayed in hospital for 3 or more nights, and who were not attended by a doctor on scene, were eligible for inclusion.

Randomised cases

An attempt was made to randomise the dispatch of EMT or paramedic crews to '999' trauma calls. A total of 185 calls were randomised, but only 16 of these patients met the inclusion criteria for serious trauma (n = 8 paramedic cases, n = 8 EMT cases). These cases were added to the main cohort to give n = 1440 paramedic cases and n = 605 technician cases followed up in the main study.

Data collection

Characteristics of the incidents, the patients and their injuries, and the crews attending were taken from ambulance service dispatch records and patient report forms, from hospital accident and emergency (A&E), inpatient, and administrative records, and from coroners' records. Death was assessed from hospital and coroners' records at 6 months post-incident, and a random sample of n = 428 survivors were sent a follow-up questionnaire at 6 months post-incident, asking about use of healthcare services and including the Short Form 36-item questionnaire (SF-36).

Avoidable deaths

A stratified random sample of 244 deaths occurring within 3 days of the incident was examined by a panel of five experts in pre-hospital care to assess the role of pre-hospital care in any avoidable deaths.

Results

Processes

For all patients in the main cohort, mean length of stay was 15.2 nights, and 5.9% were admitted to intensive care. There were no significant differences between patients attended by paramedics or EMTs before or after adjustment for casemix.

Paramedic crews spent 2 minutes longer on scene than technician crews even after adjustment for casemix ($p < 0.01$). The difference was due to cases in which paramedics had cannulated or intubated the patient who had mean on-scene times 12 minutes longer than patients with no paramedic interventions.

Mortality

There was a total of 114 deaths from trauma related causes within 6 months of the incident; 86 in 1440 patients ever attended by paramedics (6.0%) and 28 in 605 patients only attended by EMTs (4.6%). Adjustment for casemix increased this difference, as did analysis by type of crew first on scene. Adjusted for casemix, the ratio of the odds of death in patients first attended by paramedics to the odds of death in patients first attended by EMTs was 2.02 (95% confidence interval (CI): 1.05, 3.89). This corresponds to an increase in risk of death from 4.5% to 8.7% (95% CI: 4.7%, 15.5%). This increased risk was similar for deaths before arrival at A&E, in A&E, or after admission. A small part of the differ-

ence was explained by the extra time on scene spent by paramedics.

The increased risk of death was only observed in patients with 'bleeding injuries' (penetrating injuries, injuries to abdomen or thorax, major or multiple limb fractures; estimated relative risk 4.6, 95% CI: 1.1, 20.0), and there was no increased risk in patients with head injuries or other trauma.

Avoidable deaths

Excluding 65 cases recorded as found dead on scene, and blinded to the type of crew attending, the panel assessed that 17/120 (14.2%) deaths in patients attended by paramedics were possibly avoidable, and 4/59 (6.8%) in patients attended by EMTs.

For deaths judged to be probably avoidable, the proportions were 8/120 (6.7%) for paramedic attended patients and 0/59 for EMT patients ($p = 0.02$). The difference remained when cases possibly dead before the ambulance arrived at the scene were excluded.

The overall rate of cases judged probably avoidable was just 1.4% of all deaths within 3 days of the incident.

Morbidity

Outcomes in survivors showed the opposite effects. Survivors attended by paramedic crews had fewer days off from their usual activities, and had better scores on all SF-36 health dimensions. These differences were significant for comparisons by type of crew first on scene adjusted for casemix for five of the eight dimensions. The differences were large enough to be clinically important, and could not be explained by the excess mortality in the paramedic cases (a survivor effect).

Costs

The total cost of treatment was estimated to be just £22 (1%) more expensive for patients who were attended by a paramedic crew than a technician crew, and this difference is not at all statistically significant ($p = 0.82$).

Conclusion

There was no evidence from this study to support the view that a substantial proportion of pre-hospital deaths are avoidable, as suggested by previous studies.

The authors conclude that the protocols used by paramedics increase the mortality from serious trauma involving bleeding injuries, but may also lead to better outcomes for survivors. The observed increase in mortality may be due to factors such as delays on scene and inappropriate pre-hospital fluid infusion.

Recommendations for further research

An associated Health Technology Assessment study examining two paramedic fluid resuscitation protocols in blunt trauma is currently underway. If this comparison project finds poorer outcomes in blunt trauma resulting from fluid resuscitation, then it will still be necessary to go on to resolve whether this is due to the types of patients, the timing of resuscitation, the type of fluids used or the amount of fluid infused (or a combination of these factors). However, other studies comparing different training and protocol packages are also needed, specifically these should include:

- A comparison of the effectiveness of different pre-hospital time protocols in untrapped patients with bleeding injuries (e.g. an open protocol versus a limit of 10 minutes on scene).
- A comparison of training programmes, using similar protocols, to examine whether the skills developed in the longer degree-type courses beginning to be offered to paramedics make a difference to the way in which protocols are implemented and their effectiveness.

NHS R&D HTA Programme

The overall aim of the NHS R&D Health Technology Assessment (HTA) programme is to ensure that high-quality research information on the costs, effectiveness and broader impact of health technologies is produced in the most efficient way for those who use, manage and work in the NHS. Research is undertaken in those areas where the evidence will lead to the greatest benefits to patients, either through improved patient outcomes or the most efficient use of NHS resources.

The Standing Group on Health Technology advises on national priorities for health technology assessment. Six advisory panels assist the Standing Group in identifying and prioritising projects. These priorities are then considered by the HTA Commissioning Board supported by the National Coordinating Centre for HTA (NCCHTA).

This report is one of a series covering acute care, diagnostics and imaging, methodology, pharmaceuticals, population screening, and primary and community care. It was identified as a priority by the Acute Sector Panel and funded as project number 93/23/18.

The views expressed in this publication are those of the authors and not necessarily those of the Standing Group, the Commissioning Board, the Panel members or the Department of Health. The editors wish to emphasise that funding and publication of this research by the NHS should not be taken as implicit support for the recommendations for policy contained herein. In particular, policy options in the area of screening will, in England, be considered by the National Screening Committee. This Committee, chaired by the Chief Medical Officer, will take into account the views expressed here, further available evidence and other relevant considerations.

Reviews in *Health Technology Assessment* are termed 'systematic' when the account of the search, appraisal and synthesis methods (to minimise biases and random errors) would, in theory, permit the replication of the review by others.

The editors have tried to ensure the accuracy of this report but cannot accept responsibility for any errors or omissions. They would like to thank the referees for their constructive comments on the draft document.

Copies of this report can be obtained from:

The National Coordinating Centre for Health Technology Assessment,
Mailpoint 728, Boldrewood,
University of Southampton,
Southampton, SO16 7PX, UK.
Fax: +44 (0) 1703 595 639 Email: hta@soton.ac.uk
http://www.soton.ac.uk/~hta

ISSN 1366-5278