Hospital cost is reduced by motorcycle helmet use
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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The wearing of helmets by motorcyclists was compared with not wearing helmets.

Type of intervention
Primary and secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised motorcyclists over 15 years of age who had been admitted to hospital after a crash.

Setting
The setting was secondary care. The economic study was carried out in Michigan, USA.

Dates to which data relate
The effectiveness and resource data related to 1996 to 2000. No price year was given.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
Hospital costs were assessed for the same study sample as that used for the effectiveness analysis. Rehabilitation costs were assessed on the basis of a sub-group from the same sample as that used for the effectiveness analysis. The costing was carried out retrospectively.

Study sample
No power calculations were reported. All motorcycle patients admitted to the trauma centre after crashes, for whom cost data were available, were included. There was no sample selection. A total of 216 patients were included, of which 174 were wearing helmets and 42 were not wearing helmets. The mean age of those wearing helmets was 37 (+/- 13) years (range: 16 - 76) and 90% were males. The mean age of those not wearing helmets was 32 (+/- 12) years (range: 16 - 74) and 93% were males.

Study design
This was a single-centre, retrospective, non-randomised trial with concurrent controls. There was no follow-up after the
patients left hospital.

**Analysis of effectiveness**
The basis of the analysis was intention to treat. The primary health outcomes used were:

- the mortality rate,
- the Injury Severity Score (ISS),
- the Abbreviated Injury Scale score to an injured body region,
- the length of hospital stay, and
- the length of stay in an intensive care unit (ICU).

The two groups were shown to be comparable in terms of the gender ratio, but the average age of the unhelmeted victims was significantly lower than that of the helmeted victims, (p<0.02).

**Effectiveness results**
The mortality rate was 4.0% for helmeted riders and 4.8% for non-helmeted riders. The difference was not statistically significant.

The ISS was 16.9 (+/- 11.5) in the helmeted group and 17.4 (+/- 12.9) in the unhelmeted group.

When the abbreviated injury scale scores by site of injury were compared, there were generally no significant differences between the two groups. The exception was for head and neck injuries, which showed a significantly higher score for the unhelmeted group (2.8 +/- 0.9) than for the helmeted group (2.7 +/- 1.0), (p<0.02).

There was no statistically significant difference in the length of hospital stay, which was 11.4 (+/- 10.9) in the helmeted group versus 13.5 (+/- 17.3) days in the unhelmeted group. Similarly, there was statistically significant difference in the ICU length of stay (3.5 +/- 7.5 days in the helmeted group versus 3.5 +/- 6.7 days in the unhelmeted group).

**Clinical conclusions**
The authors did not provide a clinical conclusion. The results showed that the helmeted patients reaching hospital suffered less severe head injuries than the unhelmeted patients. The other measures of injury and mortality did not show a difference between the two groups.

**Measure of benefits used in the economic analysis**
No summary measure of benefits was used. The study was, in effect, a cost-consequences analysis.

**Direct costs**
No discounting was carried out as the patients were in hospital for less than a year. The quantities and the unit costs were not analysed separately. The total hospital costs were given for all the patients in the study and for a sub-group of these patients (23 helmeted and 3 unhelmeted). Rehabilitation costs, which were incurred in a rehabilitation centre connected to the hospital, were also given. The source of the data was the authors' institution (University of Michigan Health System Data Warehouse). No price year was given.

**Statistical analysis of costs**
No statistical analysis of the costs was carried out.
Indirect Costs
No indirect costs were given.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was carried out.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.

Cost results
The average inpatient costs were $31,158 (range: 1,161 - 228,253) for helmeted patients and $37,317 (range: 1,207 - 148,144) for unhelmeted patients.

For the sub-group of patients who attended the hospital’s rehabilitation centre, the mean rehabilitation costs were $23,201 (range: 3,049 - 101,887; median 17,019) for helmeted patients and $43,053 (range: 34,839 - 50,581; median 43,739) for unhelmeted patients.

The costs of any adverse effects would have been dealt with in the costing.

Synthesis of costs and benefits
The costs and benefits were not combined as the study was, in effect, a cost-consequences analysis.

Authors' conclusions
The hospital costs were lower for helmeted patients than for unhelmeted patients. The head injuries of helmeted patients were less severe.

CRD COMMENTARY - Selection of comparators
The choice of the comparator, no wearing of helmets by motorcyclists, was justified by it being the obvious alternative.

Validity of estimate of measure of effectiveness
The source of the effectiveness data was a retrospective cohort study. Whilst this is an acceptable study design, it includes a number of inherent biases. The sample size was small in this study and, therefore, the study might have had insufficient power to detect significant differences in outcomes between the two groups. Moreover, and for the same reason, it seems unlikely that the study sample could have been representative of the study population. Patients who died at the scene of the accident were not included in the study, so unhelmeted and helmeted patients might not have been representative of the study population. In addition, the non helmet wearers were a different kind of personality from the helmet wearers, as they were more willing to take risks and this was not discussed in the study. The two groups were shown to be comparable in terms of gender, but not in terms of age. This might be a confounding factor that has biased the results. The analysis of effectiveness was not handled credibly since, as the authors stated, the only patients included were those who survived an accident and were sent to hospital. Thus, no relevant conclusions on mortality can be drawn from the data. Helmet use by motorcycle passengers may lead to lower mortality but more long-term invalids, and therefore higher health care costs. To understand the total consequences of helmet use, all passengers involved in accidents need to be included.
Validity of estimate of measure of benefit
The authors did not derive a summary measure of health benefit.

Validity of estimate of costs
The authors appear to have adopted the cost perspective of the hospital in their study. However, the details of the costs were not given, so the reader cannot be certain that all the costs were included. A more complete picture of hospital costs was given for the sub-sample of patients for whom inpatient rehabilitation costs were reported. However, no outpatient rehabilitation costs were reported. In addition, non-hospital medical costs were not given, which could be considerable for accident victims and would be relevant information for health care decision-makers. No costs of informal care were included. No indirect costs were included, which was appropriate for the perspective adopted, although the authors pointed out that these costs could be very high when a young accident victim is unable to work for many years. The unit costs and the quantities were not reported separately, which will limit the generalisability of the authors' results to other settings. The quantities were taken from a single centre and the prices were taken from the author's setting. Uncertainty in these estimates was not explored, as statistical and sensitivity analyses of the prices were not performed. The price year was not reported, which will hinder any future reflation exercises.

Other issues
The authors did not compare their results with those of other studies. The generalisability to other settings was not addressed. The authors did not present their results selectively and their conclusions reflect the scope of the analysis. The authors reported some limitations of their study. In particular, only survivors of accidents were included and long-term medical costs were not included. Those caveats limit the validity of both the effectiveness and the cost analyses.

Implications of the study
The authors recommended that states should continue to enforce current helmet laws, or to enact universal helmet laws. They also recommended higher insurance premiums for unhelmeted motorcycle riders.

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