Head, neck, and facial injuries in ice hockey: the effect of protective equipment
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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
Using protective equipment for the primary prevention of hockey-related head, neck and facial injuries.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
Patients engaged in organized and nonorganized ice hockey, who had ice hockey-related head or neck or facial injury.

Setting
Community and hospital. The economic study was carried out in Ontario, Canada.

Dates to which data relate
The effectiveness and resource use data were collected between 1993 and 1995. The price date was 1996.

Source of effectiveness data
The evidence for the final outcomes was derived from a single study.

Link between effectiveness and cost data
The costing was undertaken prospectively on the same patient sample as that used in the effectiveness study.

Study sample
A total of 226 patients were included in the study, without power calculations being reported.

Study design
The study was a case series from a single centre. The duration of follow-up was not clearly reported. The loss to follow-up was 10%.

Analysis of effectiveness
The principle used in the analysis was treatment completers only. The primary health outcome was the percentage of patients using protection (by type), and distribution of the injuries according to region of the body affected:
Quadrant 1, Injury occurring to the area above the lateral line at the start of the nasolabial fold (nose, eyes, forehead and cheeks);

Quadrant 2, Injury occurring to the area below the lateral line at the start of the nasolabial fold down to the mandibular junction with the neck (lips, teeth, mandible);

Quadrant 3, injury occurring to the area below the margin of the jaw and down the neck to the clavicle ('chin', anterior neck, trachea).

**Effectiveness results**

While 84% (n=189) of the patients were wearing a helmet at the time of the injury, full facial protection, in the form of a cage/full visor, was worn by 24% (n=55) of the injured individuals, whereas half-visors were used by 23% (n=52). Full facial protection prevented injuries to quadrant 1, but not to quadrants 2 and 3 (below the upper face; p=0.0001). On the other hand, the injured patients using half-visors (partial facial protection) had the same distribution of injuries as individuals wearing no specific facial protection (p>0.05).

**Clinical conclusions**

The study revealed that the hockey-related injuries were very common in the study site while the use of full facial protection was less common.

**Measure of benefits used in the economic analysis**

Face injuries avoided was used as the benefit measure.

**Direct costs**

Quantities of resource use were not reported separately from the costs. The cost items were reported separately. The costs consisted only of acute care ED costs and did not include rehabilitation, outpatient, follow-up, or treatment cost of a quadriplegic case occurring in the clinical study. It was not specified from whose perspective the cost analysis was performed. The estimates were derived from actual resource use data from the clinical study, unit costs from Ontario Health Insurance Plan, and data from a study published in 1995 (The costs associated with the provision of protection for hockey players were not considered in the analysis). 1996 price data were used.

**Indirect Costs**

Not considered.

**Currency**

Canadian dollars (Can$).

**Sensitivity analysis**

No sensitivity analysis was performed.

**Estimated benefits used in the economic analysis**

Full facial protection prevented injuries to quadrant 1, but not to quadrants 2 and 3 (below the upper face; p=0.0001). On the other hand, the injured patients using half-visors (partial facial protection) had the same distribution of injuries as individuals wearing no specific facial protection (p>0.05).

**Cost results**
The total cost associated with the treatment of a hockey injury was Can$20,500 per year for the winter months (Can$41,000 for the 2-year clinical study period). The authors estimated that between 2.7 and 3.0 million Canadian dollars in direct medical costs are incurred each year in Ontario to provide immediate care for hockey-related injuries to the area above the shoulders.

Synthesis of costs and benefits
Not combined.

Authors’ conclusions
Hockey head, neck, and facial injuries occur predominantly among older males. Full facial protection is notably underused, and injuries to the upper facial quadrant, especially the eyes, can be serious. Community education and the promotion of facial protection appear to be options available to authorities, and there is a clear need for safety strategies to be promoted. In addition, the potential institution of facial protection legislation should be considered. Further research is required to identify why men who participate in hockey are reluctant to use protective equipment and whether this is a geographical variation related to safety awareness or a true age-related phenomenon (a negative relationship was found in the study between the percentage of patients using some kind of facial protection and age).

CRD COMMENTARY - Selection of comparators
The reason for the choice of comparator (the ‘do nothing’ option - i.e. no facial protection) is clear.

Validity of estimate of measure of benefit
The internal validity of the study results is questionable due to the lack of randomisation and a proper control group.

Validity of estimate of costs
Quantities of resource use were not analysed separately from the costs. The costs associated with the intervention (i.e. provision of protective equipment for the non-organized hockey players, for instance) were not included in the analysis. A proper comparison in terms of costs was not made between those who had proper facial protection and those who did not.

Other issues
In view of the lack of randomisation, sensitivity analysis, and statistical analysis of the costs, the results need to be treated with some caution. The conclusions were justified in terms of the statistical tests of the injury distributions between patients using and not using facial protection. The issue of generalisability to other settings or countries was not adequately addressed.

Implications of the study
Further studies are needed in order to obtain valid evidence with regard to the cost-effectiveness of preventive programmes for the avoidance of injuries related to the practice of organized and nonorganized ice-hockey.

Source of funding
Funded in part by the Ministry of Health, Ontario, through the Northeast Regional Trauma Network.

Bibliographic details