A cost-benefit analysis of risk-reduction strategies targeted at older drivers

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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 study examined several strategies targeted at reducing the risk of older drivers being involved in motor-vehicle collisions (MVCs). There were four screening strategies, one mass targeted intervention (prevention) and a do-nothing strategy (re-licensing as usual).

The screening strategies were based on combinations of perceptive-cognitive measures considered as strong predictors of MVCs. Specifically, the following four alternative strategies were considered:

- screen drivers with the Useful Field of View (UFOV) test alone (screen 1);
- screen drivers with the UFOV test and the Motor Free Visual Perception Test (MVPT) (screen 2);
- screen drivers with the UFOV test, the MVPT and Trails B test (screen 3);
- screen drivers with the UFOV test, MVPT, Trails B test and Delayed Recall test.

The target intervention was aimed at maintaining or improving functional abilities. It consisted of a mass intervention (without screening) to improve the speed of processing. A detailed description of all screening strategies and the mass intervention was provided.

Type of intervention
Screening and primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised a hypothetical cohort of senior drivers aged 75 years and older presenting for licence renewal.

Setting
The setting was the community. The economic study was carried out in the USA.

Dates to which data relate
The effectiveness data and some information on resource use were derived from studies published in 2002 and 2006. The price year was 2003.

Source of effectiveness data
The clinical data used in the economic evaluation were the effectiveness of the targeted intervention, the probability of
older drivers being involved in MVCs with the do nothing strategy, and the accuracy of the four screening strategies.

**Modelling**
The main objective of the decision tree, the structure of which was represented graphically, was to determine which relicensing protocol had the lowest per driver expected costs. In the model, older drivers could receive one of the four screening strategies, mass intervention or do nothing. Drivers who passed the screen were licensed as usual. Drivers who failed any component of a screening arm were considered to have failed the screen. Those who failed a screen were provided with the speed-of-processing intervention and were simultaneously licensed. The time horizon of the model was not reported, but data were available for up to 5-years of follow-up.

**Sources searched to identify primary studies**
The accuracy of screening, in terms of both the sensitivity and specificity, was derived from research conducted between November 1998 and October 1999 in three Motor Vehicle Administration site offices in Maryland, where 366 senior drivers were enrolled and prospective MVC records were gathered for a period of 4.18 to 5.13 years following screening assessment. The Maryland study was also used to derive the probability of MVC involvement without any intervention. The effectiveness of the intervention in terms of training gains on the UFOV test was based on results from a randomised clinical trial (RCT).

**Methods used to judge relevance and validity, and for extracting data**
The authors did not describe the approach used to identify the clinical estimates. No inclusion criteria were specified for any of the parameters. The method used to select the estimates was neither reported nor discussed.

**Measure of benefits used in the economic analysis**
The accuracy of the screening strategies, the effectiveness of the targeted intervention, and the effectiveness of the do nothing option were considered as outcomes of the strategies under examination. These values were derived from the literature, as reported above, and were used as the main model inputs. However, they were not combined with the costs as a cost-consequences analysis was carried out.

**Direct costs**
The perspective adopted in the study was unclear, but it might have been societal. The costs considered in the analysis were those associated with screening, the manufacturing and packaging of a CD containing the intervention protocol and the time spent completing the intervention, and an MVC (ranging from no injury to death). The unit costs were presented separately from the resources used for most items. The screening costs (including administrative and support services) were derived from average hourly wages for the Maryland Motor Vehicle Administration. Costs associated with the intervention came from the American Automobile Association and the Maryland study. The costs of an MVC came from the National Safety Council. The costs associated with time spent for completing the intervention were taken from the mean hourly earnings in Maryland. Discounting was not relevant as the costs were incurred during a short timeframe. The price year was 2003.

**Statistical analysis of costs**
The costs were treated deterministically.

**Indirect Costs**
Productivity costs were not considered in the analysis.

**Currency**
US dollars ($).
Sensitivity analysis
A univariate sensitivity analysis was carried out to assess the robustness of the cost estimates to variations in the intervention costs, intervention effectiveness and collision costs. The authors set the alternative values.

Estimated benefits used in the economic analysis
The sensitivity of the screening strategies was 0.4615 for screen 1, 0.6154 for screen 2, 0.6923 for screen 3 and 0.7308 for screen 4. The specificity values were 0.5545 (screen 1), 0.5 (screen 2), 0.4618 (screen 3) and 0.3941 (screen 4), respectively.

The effectiveness of the intervention was 86% (range: 0 to 100).

The probability of any driver aged 75 or over being involved in an MVC with the do nothing strategy was 0.0710.

All these data were used as the main model inputs to obtain the probability of having an MVC and then to calculate the cost per driver.

Cost results
The expected costs per driver were:

- $493.30 with the mass targeted intervention,
- $753.37 with screen 4 (plus targeted intervention for those who fail),
- $786.95 for screen 3 (plus targeted intervention for those who fail),
- $878.21 for screen 2 (plus targeted intervention for those who fail),
- $1,066.92 with screen 1 (plus targeted intervention for those who fail), and
- $1,562.84 with do nothing.

The sensitivity analysis showed that the base-case results were robust to changes in the clinical and economic inputs. The targeted intervention was the cheapest strategy, regardless of the intervention costs and as long as the intervention effectiveness was greater than 25% (it was 86% in the base-case analysis). An interesting result was that if the cost of collision was less than $3,655.30 ($22,000 in the base-case), do nothing was the cheapest strategy. If the cost of collision was between $3,655.30 and $6,378.40, the least expensive option was screen 3. Finally, if the cost of collision was greater than $6,378.40, the mass intervention was again the cheapest option.

Synthesis of costs and benefits
A synthesis of the costs and benefits was not relevant as a cost-consequences analysis was carried out.

Authors' conclusions
A prevention-oriented approach of providing the speed-of-processing intervention to all drivers aged 75 years or older presenting for licence renewal was the most cost-beneficial option, mainly because of its great efficacy and relatively low cost in comparison with the other proposed protocols.

CRD COMMENTARY - Selection of comparators
The selection of the comparators was appropriate as relevant strategies were examined in the study. An extensive description of all protocols was provided. You should decide whether they are valid comparators in your own setting.
Validity of estimate of measure of effectiveness
The effectiveness evidence came from two published studies, one of which was an RCT. RCTs usually have great internal validity, which should ensure the appropriateness of the clinical estimates. The second source was a longitudinal study that followed individuals for a long time. The primary studies were presumably identified selectively and no systematic search for data was reported. Only intervention efficacy was varied in the sensitivity analysis.

Validity of estimate of measure of benefit
No summary benefit measure was used as a cost-consequences analysis was conducted. Please refer to the comments under the 'Validity of estimate of measure of effectiveness' field (above).

Validity of estimate of costs
The perspective of the analysis of the costs was not explicitly stated. A broad viewpoint was adopted as the cost categories covered not only the costs strictly associated with the protocols, but also the time spent completing the intervention. The sources of the costs were reported for all items. Overall, there were extensive details on the calculation of the costs and the unit costs were presented separately from the quantities of resources used for most items. Statistical analyses of the costs were not performed, but the impact of changing model inputs was investigated in the sensitivity analysis. The price year was reported, which will facilitate reflation exercises in other settings.

Other issues
The authors did not compare their findings with those from other studies. They also did not explicitly address the issue of the generalisability of the study results to other settings. The sensitivity analysis only provided a partial investigation into the external validity of the study results. The authors noted some limitations of the analysis, such as the use of data from a sample of well-motivated senior drivers and the issue of intervention compliance given that access to a computer might inhibit completion of the intervention in older drivers. In addition, data on the sensitivity and specificity of the screening tests were obtained from a relatively small sample of MVC incidents.

Implications of the study
The study results support the prevention-oriented approach of providing the speed-of-processing intervention to all drivers aged 75 years or older. A striking result of the analysis was that the current protocol for licence renewal is not able to accurately assess which drivers are at-risk for collision and which drivers are not.

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