Diagnosis and treatment of minimal hepatic encephalopathy to prevent motor vehicle accidents: a cost-effectiveness analysis
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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.

CRD summary
This study examined the cost-effectiveness of strategies for the detection and treatment of minimal hepatic encephalopathy (MHE), in patients with cirrhosis. The authors concluded that diagnosis of MHE, followed by lactulose therapy, reduced the rate of motor vehicle accidents, which reduced the societal costs, especially when conducting rapid testing using the inhibitory control test. The data sources were not clearly described, but the methods were valid and the authors’ conclusions appear to be robust.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study examined the cost-effectiveness of strategies for the detection and treatment of minimal hepatic encephalopathy (MHE), in patients with cirrhosis, to reduce the costs and morbidity associated with motor vehicle accidents.

Interventions
Five strategies were considered: treatment for all cirrhosis patients; diagnosis by neuropsychological examination, with treatment; diagnosis by standard psychometric tests, with treatment; diagnosis by rapid screening using the inhibitory control test, with treatment; and no treatment (usual care). The treatments were lactulose or rifaximin 550mg, twice daily. Testing for MHE was conducted twice a year.

Location/setting
USA/secondary care.

Methods
Analytical approach:
The analysis was based on a Markov model, with a five-year time horizon. The authors stated that a societal perspective was adopted.

Effectiveness data:
The clinical estimates were from published literature. Adherence to treatment was from clinical trials, with some authors’ assumptions. It was assumed that the risk of motor vehicle accidents for patients on either lactulose or rifaximin was reduced to that of patients without MHE. The accuracy of screening tests (sensitivity and specificity) was the key input for the model and was from published studies.

Monetary benefit and utility valuations:
Not considered.

Measure of benefit:
The benefit measure was the number of motor vehicle accidents prevented. A 3% annual discount rate was applied.

Cost data:
The economic analysis included the costs of diagnosis and treatment of MHE, including patient time, and the savings
from the prevention of motor vehicle accidents, through the effective management of cognitive impairment. The medical costs were from published sources. The cost of accidents was based on estimates provided by the National Highway and Traffic Administration. The value of patient time came from official wages reported by the Bureau of Labor Statistics. A 3% annual discount rate was applied. The price year was 2010 and the costs were expressed in US $.

Analysis of uncertainty:
One-way sensitivity analyses were carried out on all the model inputs.

Results
In a hypothetical cohort of 1,000 patients receiving treatment with lactulose, the number of accidents prevented was 205.94 with treatment, 202.20 with rapid testing, 204.164 with standard testing, and 205.94 with neuropsychological examination. The net programme costs (costs minus savings) were -$2.4 million with treatment, -$3.6 million with rapid testing, -$3.4 million with standard testing, and -$1.7 million with neuropsychological examination.

All strategies were cheaper and more effective than no treatment, due to the reduction in motor vehicle accidents. The cost per accident prevented was $30,469 with treatment, $24,454 with rapid testing, $25,470 with standard testing, and $33,742 with neuropsychological examination. The rapid test and standard tests were preferred, both in the main analysis and in the sensitivity analyses.

In the cohort receiving treatment with rifaximin, the number of accidents prevented was 279.49 with treatment, 274.41 with rapid testing, 277.07 with standard testing, and 279.49 with neuropsychological examination. The net programme costs were $35.1 million with treatment, $25.0 million with rapid testing, $25.3 million with standard testing, and $19.5 million with neuropsychological examination.

The cost per accident prevented was $167,633 with treatment, $133,085 with rapid testing, $133,564 with standard testing, and $111,760 with neuropsychological examination. Neuropsychological examination was the most cost-effective strategy, but none of the strategies was dominant because of the high cost of treatment. At a rifaximin monthly cost of $353, rapid testing became cost saving and was dominant.

Authors' conclusions
The authors concluded that diagnosis of MHE, followed by lactulose therapy, reduced the rate of motor vehicle accidents, which reduced the societal costs, especially when conducting rapid testing using the inhibitory control test.

CRD commentary
Interventions:
The selection of the comparators was appropriate, as a range of available screening and treatment strategies was considered.

Effectiveness/benefits:
The clinical data were not extensively described. No systematic review was reported to identify the relevant sources from the published literature. The adherence rate was from clinical trials; assumptions were made on the impact of treatment in reducing motor vehicle accidents, as no published studies were found. The methods used in the data sources were not reported, making it impossible to judge the quality of the evidence, but extensive sensitivity analyses were carried out on these inputs. The authors stated that the rate of motor vehicle accidents was the preferred outcome, but other benefits could have been relevant, such as quality-adjusted life-years.

Costs:
The categories of costs reflected the perspective of the society as stated by the authors. Those costs borne by patients, the health care payer, and other authorities were considered. The value of patient time and the cost of accidents were from relevant US sources, but little information was provided on the other cost items. Some costs were varied in the sensitivity analysis. The price year was reported, allowing reflation exercises, and the discount rate reflected US guidelines.

Analysis and results:
The results were clearly presented for all strategies. An incremental approach was appropriately used to combine the
costs and benefits of the strategies. Univariate analyses assessed uncertainty, and the results were clearly reported and discussed. The authors acknowledged some limitations to their analysis mainly due to the lack of valid sources for the treatment effect. The findings were specific to the USA and cannot be transferred to other settings, as reported by the authors.

Concluding remarks:
The data sources were not clearly described, but the methods were valid and the authors' conclusions appear to be robust.

Funding
Supported by grants from the National Institute of Mental Health, the National Center for Complementary and Alternative Medicine, the National Institute of Diabetes and Digestive and Kidney Diseases, and the American College of Gastroenterology.

Bibliographic details

PubMedID
22135042

DOI
10.1002/hep.25507

Original Paper URL

Indexing Status
Subject indexing assigned by NLM

MeSH
Accidents, Traffic /economics /prevention & control; Aged; Cohort Studies; Cost-Benefit Analysis; Follow-Up Studies; Gastrointestinal Agents /economics /therapeutic use; Hepatic Encephalopathy /diagnosis /drug therapy /etiology; Humans; Lactulose /economics /therapeutic use; Liver Cirrhosis /complications; Markov Chains; Middle Aged; Neuropsychological Tests; Psychometrics; Rifamycins /economics /therapeutic use; Severity of Illness Index; United States

AccessionNumber
22012016261

Date bibliographic record published
26/07/2012

Date abstract record published
18/12/2012