Craniotomy for intracranial aneurysm and subarachnoid hemorrhage: is course, cost, or outcome affected by age?
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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
Craniotomy for intracranial aneurysm and subarachnoid hemorrhage (SAH).

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients undergoing craniotomy for intracranial aneurysm and SAH.

Setting
Hospital. The economic study was carried out in Florida, USA.

Dates to which data relate
The effectiveness and resource use data were collected between 1989 and 1994. The price year was not explicitly stated.

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

Link between effectiveness and cost data
The costing was retrospectively undertaken on the same patient sample as that used in the effectiveness study. However, a database was used to gather patient-related cost data in a prospective manner thus increasing the reliability of this information.

Study sample
Power calculations were not prospectively used to determine the sample size, but it was reported that retrospective power analysis showed that each study group had a sufficient number of patients to reveal the potential differences in terms of mortality rate. The study sample consisted of a cohort of 219 patients who underwent craniotomy for intracranial aneurysm and SAH over 6 years. The patients were divided by age into two groups: single advanced age (under 65 years and 65 years and over) and decade of age (23 to 39 (n=35), 40 to 49 (n=50), 50 to 59 (n=66), 60 to 69 (n=42), and 70 to 81 (n=26) years). For the single advanced age group (n=172), the mean age was 48.2 years for the group under 65 years, versus 71.2 years for the group equal to or over 65. For the decade of age group (n=47) the mean...
age was 71.2 years.

**Study design**
This was a prospective cohort study. The duration of the follow-up was until discharge. No loss to follow-up was reported.

**Analysis of effectiveness**
The principle (intention to treat or treatment completers only) used in the analysis of effectiveness was not explicitly specified. The primary health outcomes used in the analysis were complications in the surgical intensive care unit (SICU), number of days in the SICU and the hospital, morbidity measured by Acute Physiology and Chronic Health Evaluation (APACHE) II score at admission and discharge (gauging severity of illness) and by the Hunt-Hess (HH) grade at admission and immediately preoperatively (gauging severity of neurological insult), quality of life (QOL) score, complications, and mortality. Multiple regression analysis was performed to identify the variables having close correlation with QOL score.

**Effectiveness results**
The most common complication in the group aged under 65 years was hypertension (n=57) followed by cerebral vasospasm (n=40) and arrhythmia (n=26). The corresponding figures for the group aged over 65 years were 20, 6 and 5. The duration of SICU care, which ranged from 4 to 10.5 days, was estimated not to differ by decade of age. However, with the 65-year-based division, the group aged over 65 had significantly more SICU days (10.5 (range: 1 - 45) days versus 5 (range: 1 - 60) days, p=0.008). The duration of hospitalisation before operation was 3 days (range: 0 - 24, p=0.017) in the over 65 group and 2 days (range: 0 - 65) in under 65 group. The mortality rate was 4.6% (under 65s) and 13% (p=0.008) (over 65s). In terms of decade of age, the mortality rate ranged from 3% in the 50 to 59 years category to 17% in the 70 to 81 years category. The differences across the subgroups were not significant except for the 70 to 81 years category compared with the 50 to 59 years category. The APACHE score at discharge ranged from 3 in the 23 to 39 years category to 10 in the 70 to 79 years category. The corresponding values for the under and over 65 years groups were 5 to 10, (p<0.05). HH grade at operation ranged from 2 in the 40 to 49 years category to 3 in the 70 to 79 years category. QOL score ranged from 1 in the 23 to 39 years category to 2 in the 60 to 69 years category. The corresponding values for the under and over 65 years groups were 1 and 2, (p<0.01).

**Clinical conclusions**
Clinical grade, as represented by HH score, did not differ by age, which suggests that the severity of the SAH was a more important determinant than age. APACHE II scores, however, did vary by age. Therefore, it was surprising that the number of complications or duration of hospitalisation did not differ by age. This emphasises that, where risk related to comorbidity can be greater for the elderly, this is not a given.

**Measure of benefits used in the economic analysis**
No summary benefit measure was identified in the economic analysis, and only separate clinical outcomes were measured.

**Direct costs**
Discounting was not undertaken due to the short period of follow-up. Quantities were analysed separately from costs. Hospital and SICU costs were included in the analysis. The quantity/cost boundary adopted was the hospital (tertiary care centre). The direct costs included non-medical overhead costs in addition to the direct medical costs identified above. The price year was not stated.

**Statistical analysis of costs**
Mann-Whitney rank sum test was used to compare the subgroups in terms of costs.
Indirect Costs
Productivity losses were not considered.

Currency
US dollars ($).

Sensitivity analysis
Not undertaken.

Estimated benefits used in the economic analysis
Not applicable.

Cost results
Total median costs of care were estimated to be $33,861 ($17,574 for the hospital and $11,827 for SICU) in the under 65s group and $50,771 ($22,849 for hospital and $19,226 for SICU) in the over 65s group, (p=0.008). When compared in terms of decade of age, the cost differences across the subgroups were not found to be significant.

Synthesis of costs and benefits
Not combined.

Authors' conclusions
Whereas mortality was higher for the older age group, quality of life scores appeared acceptable for those who survive. Even though the hospital costs of treating elderly patients for SAH may be higher than those for younger patients, this should not be used to justify withholding care from the elderly.

CRD Commentary
No single health technology (application of craniotomy according to the age groups) was chosen as the comparator.

The internal validity of the effectiveness results should be assessed in the light of the prospective design adopted in the study. In view of the lack of a summary benefit measure, the study may be regarded as a cost-consequences analysis.

Quantities were reported separately from the costs. However, insufficient details were provided of the methods of cost estimation. Although the analysis was conducted retrospectively, the collection of cost data was undertaken prospectively.

The issue of generalisability to other settings or countries was not addressed, although appropriate comparisons were made with other studies in terms of sample size, time of surgery, age grouping outcome and comments. The results were not presented selectively. However, a synthesis of benefits and costs could have been conducted as a summary cost-effectiveness measure.

Source of funding
None stated

Bibliographic details
Stachniak J B, Layon A J, Day A L, Gallagher T J. Craniotomy for intracranial aneurysm and subarachnoid
hemorrhage: is course, cost, or outcome affected by age? Stroke 1996; 27(2): 276-281

PubMedID
8571423

Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Age Factors; Aged; Aged, 80 and over; Costs and Cost Analysis; Craniotomy /economics /mortality; Critical Care; Disabled Persons; Female; Follow-Up Studies; Humans; Intracranial Aneurysm /surgery; Male; Middle Aged; Morbidity; Quality of Life; Subarachnoid Hemorrhage /surgery; Time Factors; Treatment Outcome

AccessionNumber
21996000273

Date bibliographic record published
31/12/1999

Date abstract record published
31/12/1999