

of households occupied by smokers). Installing smoke alarms may not be the best use of the limited resources of local authorities; analyses of the cost effectiveness of such programmes are needed.

Smoke alarms that are less sensitive to cooking and cigarette smoke but still able to give early warning of a house fire merit investigation. Alternatively, sprinkler systems may be a more effective way to reduce the risk of injury due to fire.¹⁵

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Contributors: All authors participated in study conception and design, revised the manuscript critically for intellectual content, and approved the final version. DR, CD, IR, and AW analysed and interpreted results. DR oversaw programme implementation and data collection, and drafted the manuscript. Charlotte Seirberg revisited households and inspected alarms at follow up. IR is guarantor.

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Effect of patients' age on management of acute intracranial haematoma: prospective national study

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Abstract

Objective To determine whether the management of head injuries differs between patients aged ≥ 65 years and those < 65 .

Design Prospective observational national study over four years.

Setting 25 Scottish hospitals that admit trauma patients.

Participants 527 trauma patients with extradural or acute subdural haematomas.

Main outcome measures Time to cranial computed tomography in the first hospital attended, rates of transfer to neurosurgical care, rates of neurosurgical intervention, length of time to operation, and mortality in inpatients in the three months after admission.

Results Patients aged ≥ 65 years had lower survival rates than patients < 65 years. Rates were 15/18 (83%) *v* 165/167 (99%) for extradural haematoma ($P=0.007$) and 61/93 (66%) *v* 229/249 (92%) for acute subdural haematoma ($P<0.001$). Older patients were less likely to be transferred to specialist neurosurgical care (10 (56%) *v* 142 (85%) for extradural haematoma ($P=0.005$) and 56 (60%) *v* 192 (77%) for subdural haematoma ($P=0.004$)). There was no significant

difference between age groups in the incidence of neurosurgical interventions in patients who were transferred. Logistic regression analysis showed that age had a significant independent effect on transfer and on survival. Older patients had higher rates of coexisting medical conditions than younger patients, but when severity of injury, initial physiological status at presentation, or previous health were controlled for in a log linear analysis, transfer rates were still lower in older patients than in younger patients ($P<0.001$).

Conclusions Compared with those aged under 65 years, people aged 65 and over have a worse prognosis after head injury complicated by intracranial haematoma. The decision to transfer such patients to neurosurgical care seems to be biased against older patients.

Introduction

Major trauma, particularly serious head injury, is associated with high mortality in people over 65 years.¹ It has been suggested that in older patients with a Glasgow coma score of 8 or less, it is more appropriate to err on the side of inactivity and withhold intensive treatment.^{1,2} However, up to 60% of older patients with head injuries can make a full recovery³ and take up no



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more resources than younger patients.⁴ In Scotland, age has been shown to be an independent factor in the process of trauma care in elderly patients.⁵ We examined patterns of management of head injury in patients according to age.

Methods

We carried out a prospective observational study using data collected by the Scottish Trauma Audit Group, which collects data on all injured patients who are admitted to hospital in Scotland for three days or more or who die in hospital.⁶ Data on 98% of all such patients are collected.

We compared the outcome and process of care among younger patients (13-64 years) and older patients (≥ 65 years) who experienced trauma. During the four year period from 1997 to 2000, the audit group followed 3051 patients in 25 Scottish hospitals who had incurred serious head injury (score on abbreviated injury scale 3-6). To ensure a high degree of comparability of severity of injury between age groups we limited our main analyses to those who sustained either an extradural haematoma or an acute subdural haematoma but did not otherwise have a severe head injury (score on abbreviated injury scale ≥ 4).

We used Fisher's exact significance tests to compare proportions and Mann-Whitney U tests to compare measures of injury severity and physiological disorder between age groups. For rates of survival and of transfer to specialist neurosurgical care we also examined the effect of age as a continuous variable in logistic regression models with measures of injury severity, physiological status, and previous health status as covariates. We used a hierarchical log linear model to investigate the independent influences of age and pre-existing medical conditions on rates of transfer to specialist neurosurgical care.

Results

Of the 3051 patients with serious head injuries, 1227 had an extradural haematoma or acute subdural haematoma. We excluded those who had other associated serious head injuries so our main analysis was limited to 527 patients (416 aged < 65 years and 111 aged ≥ 65 years).

Rates of survival and transfer to specialist neurosurgical care were significantly lower for older patients than younger patients (table). The differences were independent of other factors contributing to survival and transfer, such as size of haematoma, other serious extracranial injuries, and measures of physiological status. (See the full version of this paper on bmj.com for further details).

There were no significant differences between age groups in the proportions of patients with low Glasgow coma scores, serious extracranial injuries, or large haematomas. Hypotension or hypoventilation that would have precluded transfer was no more common in older patients than in younger patients.

Older patients were more likely to have a pre-existing medical condition. We therefore used a log linear model to test whether age and the presence of pre-existing medical conditions had independent effects on transfer to a neurosurgical unit. Age was independently related to transfer rates; older patients were less likely to be transferred to neurosurgical units after we controlled for type of haematoma and pre-existing medical conditions ($\chi^2=17.3$, $df=1$, $P<0.001$). Neither the occurrence of pre-existing medical conditions nor the type of intracranial haematoma had additional independent influences on transfer rates ($\chi^2=0.8$, $df=1$, $P=0.37$, and $\chi^2=3.0$, $df=1$, $P=0.08$, respectively).

Other care measures

We found that patients ≥ 65 years waited longer for computed tomography than younger patients. Among the subset with an isolated extradural haematoma or subdural haematoma, older patients were as likely to be referred from the emergency department as younger patients but were subsequently less likely to be transferred to the neurosurgical unit. Of the patients with extradural haematoma or subdural haematoma who were transferred, we found no significant differences related to age in the proportion of patients who underwent neurosurgery. Overall, 20/26 (77%) older patients who underwent neurosurgery survived (2/3 with extradural haematoma, 18/23 with subdural haematoma).

Prompt neurosurgical intervention in elderly patients is essential. For patients with extradural haematoma or subdural haematoma we found no evidence that older patients were operated on later after admission than younger patients, though older patients had a longer median length of admission on the neurosurgical unit than younger patients.

Discussion

Our results support those of previous research that show that older patients with serious head injuries have poorer outcomes compared with younger patients with similar injuries. Older patients were also less likely to be transferred to specialist neurosurgical care, although there was no significant difference in their subsequent rates of neurosurgery. Age influenced neurosurgical transfer before other concomitant factors, such as size of haematoma, the incidence of serious extracranial injuries, and measures of physiological

Survival and neurosurgical transfer among patients with extradural haematoma or subdural haematoma. Figures are numbers (percentage) of patients unless stated otherwise

Outcome	Extradural haematoma				Subdural haematoma			
	<65 years (n=167)	≥ 65 years (n=18)	% difference (95% CI)	P value	<65 years (n=249)	≥ 65 years (n=93)	% difference (95% CI)	P value
Transferred	142 (85)	10 (56)	29 (6 to 53)	0.005	191 (77)	56 (60)	17 (5 to 28)	0.004
Survived	165 (99)	15 (83)	NA	0.007	229 (92)	61 (66)	NA	<0.001
Survived after transfer	141 (99)	8 (80)	NA	0.01	183 (96)	41 (73)	NA	<0.001
Survived without transfer	24 (96)	7 (87)	NA	0.43	46 (79)	20 (54)	25 (6 to 44)	0.01

NA=not applicable because sample percentage $>90\%$.

condition on arrival at hospital (including level of consciousness). Although older patients were more likely to have pre-existing medical conditions, significant differences in transfer rates related to age were still seen after we had controlled for these conditions.

Outcomes and process of care

Most previous studies have shown significantly worse outcomes in older patients with head trauma, especially those with a pre-operative Glasgow coma score ≤ 8 ,⁷⁻¹⁰ and opinion leaders have argued that doctors dealing with older patients with head injuries should "err on the side of inactivity."²

In common with these studies, we found that older patients were more likely to die from their head injuries. Despite this, overall rates of survival among older patients with extradural haematoma or subdural haematoma were not insubstantial (83% and 66%, respectively). Subsequent functional recovery of older patients with head injuries has been reported from specialist rehabilitation centres, which have shown discharge rates of up to 46% in patients aged over 65 with severe closed head injury (compared with 82% of younger patients).¹¹

Previous studies have also emphasised that intracranial haematomas are more common and larger in older patients than in younger patients.¹²⁻¹³ Rapid identification and surgical decompression of haematomas may be the most important aspect of treatment in older patients. A more aggressive approach to performing computed tomography is therefore indicated.¹²⁻¹⁴ Early computed tomography is particularly important in older patients because haematomas often present with atypical histories and often are not associated with focal signs.¹⁵ In our study, patients aged ≥ 65 years waited longer for computed tomography and did not receive a more rapid neurosurgical intervention than younger patients.

Conclusions

Our study shows clear differences between age groups in the process of care and rates of specialist intervention in patients with head injuries. It is unclear how many had valid clinical reasons for non-intervention or to what extent the differences contribute to outcome in these patients.

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What is already known on this topic

Older patients with acute intracranial haematomas have significantly higher mortality and poorer functional outcome than younger patients with similar injuries

Intracranial haematomas are larger and more common in older patients with head injury than in younger patients

Early diagnosis and surgical intervention for operable lesions is a crucial factor in determining patients' outcomes

What this study adds

Older patients with acute intracranial haematomas were less likely to be transferred for specialist neurosurgical care than younger patients with similar severities of injuries, extracranial injuries, and physiological status at presentation

Significant differences in transfer rates related to age were still seen after pre-existing medical conditions were controlled for

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Images of the good doctor in Western medicine The doctor-patient relationship



Practitioners usually recognise the importance of maintaining good relationships between doctor and patient and cultivating a good bedside manner. In the 18th century doctors perfected this art among their wealthy clientele for their own professional advantage. This painting by Mathijs Naiveu (1647-1721) captures the solicitous attentions being shown to a wealthy client. The surgeon gently bathes her feet, having let her blood into a cupping bowl. Meanwhile, the physician—whose superior status is marked by his wig—comforts the enfeebled patient and takes her pulse.

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