Process and Outcome

Neurosurgical resources and transfer policies for head injuries

JOHN S BRYDEN, BRYAN JENNETT

Abstract

Criteria for transferring head injured patients to a regional neurosurgical unit were changed to enable a larger proportion of patients admitted to primary surgical wards to have a CT scan. The yearly number of transfers doubled, more intracranial haematomas were detected, and mortality from this complication was reduced.

To operate such a policy requires seven neurosurgical beds per million for head injuries, given the Glasgow practice of early return of patients to primary surgical wards.

Introduction

Neurosurgical facilities in Britain are concentrated in regional units, as they are in most European countries. Most patients are referred from other hospitals, where preliminary screening has shown the need for specialised investigation or treatment. Many need active intervention, and by the time the neurosurgeon is consulted this is often required urgently. There are wide variations in the number of neurosurgical beds provided for similar catchment populations in different parts of the country, but most neurosurgeons claim that an adequate service can be provided only by careful control of admissions. They are particularly cautious about accepting head injuries, fearing that such patients might take up an undue proportion

of the available neurosurgical beds, thus restricting the service provided for other kinds of patient. Most units therefore limit transfer to patients with open fractures of the vault or base and those in whom there is a high suspicion of a remediable intracranial haematoma. In England and Wales in the mid-1970s only 5% of patients admitted to hospital after head injury were transferred to a neurosurgical unit.¹

Neurosurgeons in Glasgow began to question the wisdom of this policy of very selective transfer for two reasons. One was the frequency of avoidable factors contributing to death in hospital after head injury; the other was the development of computed tomography (CT). Investigations in Glasgow showed that more than half of the head injured patients who died after transfer to the neurosurgical unit had avoidable factors in their management that had contributed significantly to their death.² Similar findings later emerged from Merseyside.³ The most common factor was delay in treating an intracranial haematoma; avoidable factors also appeared to increase morbidity in survivors after this complication.⁴ When CT scanning became available it proved more reliable than angiography or exploratory burr holes in locating intracranial haematomas. Because of its safety it was used for investigating patients in whom an intracranial haematoma would not have been suspected by traditional criteria; haematomas were then often found. Some were in patients in coma who had not obviously deteriorated or had no focal signs; others were in patients who were talking but who had not (at that time) developed the classical signs of this complication.

These findings led the Glasgow neurosurgeons to encourage the transfer of more patients to the regional unit for scanning and to have them come sooner. The consequence was that the number of patients transferred each year was doubled, and mortality in patients with intracranial haematoma was reduced.⁵ In this paper we analyse the effect of this change in policy on the use of beds in the Glasgow neurosurgical unit, and we consider how to estimate the implications of adopting such a policy more widely.

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Glasgow institute and catchment region

The regional unit in Glasgow serves a population of 2.7 million and accepts patients from 21 hospitals. Three of these are almost equidistant from Edinburgh and Glasgow; for the others there is no alternative but transfer to the Glasgow unit. Head injured patients are taken only as transfers from other hospital units, never directly from the scene of the accident; even in the Southern General Hospital, in which the institute is located, all head injuries are dealt with firstly by primary surgeons, and most remain under their care. A survey in 1974 showed that 40% of patients with head injuries admitted in this region went firstly to hospitals in Glasgow and 15% to hospitals more than 30 miles (48 km) away from the neurosurgical unit. That survey included analysis of head injuries throughout Scotland, not only in neurosurgical units but in accident and emergency departments and primary surgical wards. It showed the Glasgow neurosurgical unit to be similar to Dundee and Aberdeen in its head injury practice, 4-5% of admitted cases being transferred to the regional neurosurgical unit.⁶ Subsequent reports on head injured patients transferred to the Merseyside regional neurosurgical unit in 1975 and 1976 showed an even more selective policy, with only 1% transferred.⁷

Beds and patients

The approved bed complement when the new Glasgow neurosurgical unit opened in 1970 was 114. Constraints of finance and availability of nurses, however, made it possible to commission the beds only in stages. By 1974-5 there were only 70 staffed beds, and not all of them were available for all kinds of patient, since there was a paediatric ward of 12 beds and an intensive care unit of 12 beds. In 1974-5 only half of the telephoned consultations from other hospitals about head injuries resulted in transfer to the neurosurgical unit. After an increase in the available beds at the beginning of 1978 junior staff were instructed to accept all head injured patients from other hospitals who were in coma, provided that they were breathing spontaneously and had at least one reacting pupil. Patients who were still confused six hours after injury and who also had a skull fracture were also to be transferred. No patient was to be refused admission without consultation with the senior registrar or consultant on duty. The result was that the yearly number of patients transferred almost doubled. Although some features of patients before and after the change in transfer policy were different, the proportion who were in coma when transferred, and the proportion in whom intracranial haematoma was found, remained similar. More of the same kinds of cases were being transferred; there was not a disproportionate increase in patients who were very severely injured and could not benefit from neurosurgical facilities, nor in patients with mild injury who did not need them.

Number and use of beds

During 1975 to 1981 the overall number of beds rose from 70 to 96—that is, an increase of 37%. The number used for head injuries was estimated to have doubled, whereas that for other cases went up by only 26% (table I). In 1981 head injuries accounted for 19% of admissions, compared with 13% previously; and they accounted for 20% of occupied bed days, compared with 12% before (table II).

TABLE I—Neurosurgical beds in the Glasgow institute

	1975-6	1978-9	1979-80	1980-1
Head injury	9	17	19*	19*
Other cases	61	79	77†	77†

*Adults 16, children 3.
†Adults 69, children 8.

TABLE II—Use of neurosurgical beds for head injuries

	Head injury transfers	Beds used for head injuries	% of bed days used for head injuries
1975-6	274	13	12
1978-9	432	17	18
1979-80	516	19	20
1980-1	520	19	20

At present some cases are still not accepted or their transfer is delayed—but these are few. Duration of stay for head injured patients has not changed appreciably. Patients who are conscious, have a CT scan, but need no surgery have a mean stay of 2.1 days, compared with 12.7 days for other head injury cases. Such "scan only" patients had the same stay in 1975, when they constituted only 9% of transfers, compared with 20% in 1981 (table III).

TABLE III—Duration of stay in a neurosurgical unit

	No	% of "scan only" cases	Bed days	Mean stay (days)
All head injured patients (1981)			5721	10.6
"Scan only" cases 1981	105/537	20	221	2.1
"Scan only" cases 1975	24/272	9	55	2.3

*"Scan only" cases defined as: not in coma (Glasgow score >8); did not die; stayed less than five days; did not have surgery; had CT scan.

Discussion

The wide variation between regions in the number of acute beds and in their distribution between specialties was reported by Rudge and Richards.⁸ They suggested alternative planning strategies: either bed provision can be based on studies of needs, treatment options and outcomes, or it can assume that current practice is unlikely to change grossly in the next 10 years. In the second case the population becomes the vital variable determining what bed provision is appropriate; in that event differences in the age, sex, and socioeconomic mix between one place and another may be important at district level. Their review specifically excluded regional specialties that deal with more homogeneous populations. Factors that should be considered when deciding what balance is appropriate between general and specialist beds, and between different specialties, have been described.⁹

Norms for neurosurgical beds were first proposed in 1979 by the London Health Planning Consortium¹⁰; the wide variation between these and the actual provision in some regions was subsequently pointed out.¹¹ Commenting on that paper, one of us emphasised that due account should be taken of policies governing the care of head injuries before deciding what level of neurosurgical bed provision is appropriate.¹² As mentioned above, CT scanning has considerably altered current practice in the care of patients with head injury, more of whom now need to go to regional neurosurgical units if they are to be managed by acceptable modern standards. Neurosurgeons, however, are naturally concerned that trauma cases might then take up an undue proportion of their resources, as so often happens in orthopaedic units.

But it is not only criteria for transfer of head injured patients to regional units that will determine what share of the available beds these cases will use; discharge policies are also important. In the Glasgow region it is customary for referring hospitals to readmit head injured patients without delay as soon as they no longer need the facilities of the specialist unit. Consequently only 19% of head injury discharges from this neurosurgical unit are to the patient's home. Patients with fatal injuries tend to have a relatively short stay and it is the ones with severe injuries who survive but remain in coma for many days who keep up the mean duration of stay. This is because we consider that such patients should have the benefit of the skills available in a neurosurgical unit for up to four weeks, but seldom for longer.

Different regional units may wish to develop their own transfer policies, dependent on their demography, availability of CT scanning elsewhere, and the beds provided in the unit. An algorithm or formula has been developed from which a target number of beds may be calculated for a given population, allowing for alternative policy options. When this formula is applied to the west of Scotland, under current transfer and

discharge policies and allowing a two day turn around for each bed, the estimated bed usage for head injuries is seven per million; 15% are for children.

It is not yet possible to estimate the number of neurosurgical beds per million which should be used for head injury, as distinct from those which actually are. The new Glasgow policy has been only partially successful in reducing avoidable deaths and disability; further improvements may require the transfer of even more patients at a stage when their injury still appears to be relatively mild. Such additional patients will be likely to increase only the number of patients who stay briefly in the neurosurgical unit. Determining the optimum transfer rate will entail balancing the risks in different types of patients with the numbers in different risk categories. Studies aimed at identifying these are in progress. The present Glasgow policy results in the transfer of still only 7-8% of patients with head injuries admitted to primary surgical wards; the optimum may be as many as 10-12%.

The extra beds that some neurosurgical units will require in order to provide adequate standards of care for head injuries may not call for extra regional resources. Evidence is emerging that too many patients are currently being admitted to primary surgical wards after mild head injuries,¹³ and that revised admission policies can reduce this number by as much as half.¹⁴ Some of the resources thus released could be reallocated to provide more beds in regional neurosurgical units for the care of head injured patients.

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Clinical Topics

The behaviour, development, and health of the young child: implications for care

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Abstract

Children with recurrent physical illnesses such as infections of the ears and chest are more likely than average to have developmental and behavioural disorders as well. Specialist skills are needed for the assessment and management of these disorders; the belief that "the child will grow out of it" is rarely correct. Any reorganisation of the child health services should take account of the need for children with developmental and behavioural disorders to be treated within the community by doctors and other health workers with the appropriate skills.

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Introduction

Discussion of the planning and development of the best possible health service for children in Britain and other countries often neglects the clinical issues. A recent study of the use of child health clinics¹ (apart from its lack of any epidemiological validity) was depressingly traditional in its approach and failed to review adequately the neurodevelopmental or behavioural aspects of the children or to link the findings to the children's present health. All aspects of a child's health must be reviewed if an adequate understanding of needs is to be achieved, and account should be taken of what children and their mothers perceive as their needs. The rates of general practitioner consultation for the 0-4 year old population are equalled only by those for patients over 65,² but most of these consultations are for the so called "minor" illnesses of childhood—namely, coughs, colds, and infections of the chest and ears. Certainly parents may come ostensibly with these problems when their real anxieties are about some other issue, but in our studies they rarely consulted their general practitioners formally about a developmental or behavioural problem (fewer than 5% of consultations). The purpose of this paper is to review some of the information that has led to a broadening of our view of the