

Acute neurology in a twenty-first century district general hospital

MW Weatherall

Clinical Research Fellow, Headache Group, Institute of Neurology, London

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Correspondence to MW Weatherall, Locum Consultant Neurologist, East & North Hertfordshire NHS Trust, Department of Neurology, Lister Hospital, Stevenage

tel. +44 (0)1438 781 091

e-mail mark.weatherall@doctors.org.uk

ABSTRACT A significant expansion of acute neurological services in the UK is planned, but there is little contemporary information on the burden of acute neurology in modern hospital practice. The objective of this study was to provide comprehensive information on the numbers of patients admitted with acute neurological problems, referral patterns to neurological services, and the utilisation of resources for investigation of neurological problems. The method used was a prospective survey of 1,197 acute medical admissions to a district general hospital in North-West England. It was found that neurological problems accounted for 181 (15.1%) of acute admissions. Of these, only 59 (32.6%) saw a neurologist or neurosurgeon, and only 28 (15.5%) were admitted under the neurological services. The most common presenting complaints were cerebrovascular disease (34.3%), seizures (26.5%), and headache (17.7%). One hundred and nine patients (9.1%) underwent cranial CT scanning, 68 within 48 hours of admission. It was concluded that acute neurological problems are common. In many centres, even those with embedded neurological services, they are still largely managed by general physicians. A restricted range of neurological conditions make up most of the acute case load. These facts should be taken into consideration when planning acute neurological services, and also in the delivery of undergraduate and postgraduate education in neurology.

KEYWORDS acute neurology, liaison neurology, neurological referrals

LIST OF ABBREVIATIONS Cardiovascular disease (CVD), cerebral vascular accident (CVA), computerised tomography (CT), electroencephalogram (EEG), electromyography (EMG), magnetic resonance (MR), magnetic resonance imaging (MRI), multiple sclerosis (MS), specialist registrar (SpR), transient ischaemic attack (TIA)

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INTRODUCTION

The current gold standard survey of acute neurological admissions to a district general hospital is that undertaken at Downpatrick Hospital in Northern Ireland in 1982–83, and published in the *Journal of Neurology, Neurosurgery and Psychiatry* in 1987.¹ This study found that 19% of admissions to the hospital were for a primarily neurological complaint; in addition, a further 2% of patients had an active neurological disorder which contributed to their hospital admission. Similar figures were shown in a snapshot survey of inpatients at a London teaching hospital carried out in the early 1990s, and in a more recent study concerned with the benefits of introducing a liaison neurology service.^{2,3}

General medical and neurological practices have both changed significantly in scope, nature and intensity over the last two decades. A total of 925 patients were admitted in one year in the Downpatrick study; a medium- to large-sized district general hospital can now

expect to admit more than ten times that many patients in a similar period. Given the current desire to improve acute neurological services, as outlined in the Association of British Neurologists' 2002 document *Acute Neurological Emergencies in Adults*, contemporary information is needed on the numbers of patients presenting to hospital acutely with neurological problems, and the subsequent utilisation of neurological, neurosurgical, neuroradiological and neurophysiological services.^{4,5}

METHODS

A prospective study was undertaken of acute admissions to the medical directorate of the Royal Preston Hospital, a large district general hospital in the North West of England with an embedded sub-regional neurosciences centre. Patients were admitted under the general physicians or directly to neurology, over 52 days in two periods between July and October 2003. Elective medical admissions were excluded from the analysis. All patient records were reviewed (the vast majority within 48 hours

TABLE 1 Working diagnoses on admission.

Cardiology	359
Respiratory	248
Neurology	181
Gastroenterology	121
Infectious Diseases	72
Miscellaneous	68
Psychiatry	53
Haematology	26
Oncology	19
Endocrinology	19
Renal	18
Immunology	6
Rheumatology	4
Dermatology	3

of admission) to record the age and sex of the patient, the working diagnosis at the post-take ward round (or at discharge for those admitted for less than one day), neurological co-morbidity, the potential for a neurological referral, and whether (and how) such a referral was made.

During the period under review, 1,197 patients were admitted. Seventy-three patients were admitted directly to the coronary care unit, 19 patients directly to the critical care unit, 13 patients directly to neurology, and the rest through the medical admissions unit. At the time of the survey all patients with TIA or stroke were admitted via the general physicians. Patients attending the medical admissions unit for the sole purposes of excluding deep vein thromboses were excluded, as these patients were not admitted in any case even if this condition was diagnosed. Six hundred and three patients were female (50.4%); 594 were male. The mean age of the patients was 63 years (range 16–103).

In order to give a true reflection of the workload of the neurology unit as a whole, figures were also collated for elective admissions to neurology, and emergency admissions of patients from other hospitals served in its role as a sub-regional centre.

RESULTS

Neurological problems

The breakdown of admissions by specialty is presented in Table 1. Categories contain both specific diagnoses (myocardial infarction, stroke, etc), and non-specific (chest pain, dyspnoea, unwell, etc). Neurological problems accounted for 181 admissions (15.1%). Further details of these are given in Table 4. Only three of the eleven patients admitted with thunderclap headache had proven subarachnoid haemorrhage. All five patients admitted with progressive or fluctuating weakness proved to have significant pathology (two cases of glioma; subdural haematoma; tuberculoma; epidural abscess).

TABLE 2 Neurological problems (n=181).

Seizure/s (known & suspected)	48
CVA (known & suspected)	45
TIA (known & suspected)	16
Worsening headache	12
Thunderclap headache	11
Headache with focal signs	8
Acute/episodic confusion	6
Meningitis	5
Progressive/fluctuating weakness	5
MS relapse	5
Leg weakness	5
Ataxia	2
Dizziness	2
Myaesthetic syndrome	2
Ptosis	2
Non-convulsive status	1
Neuromuscular respiratory failure	1
Amnesia	1
Neuropathy	1
Hemifacial spasm	1
Visual disturbances	1

Referrals to neurology

Of 181 patients with neurological problems, 59 (33%) were seen by a neurologist or neurosurgeon during admission. This represents 4.9% of the patients included in this survey. Forty-six of these patients were referred by the general physicians, 37 to neurology and 9 to neurosurgery. Of these, nine were admitted to neurology, and six to neurosurgery; this represents only 1.3% of those patients initially seen by the general physicians. A further 13 patients were admitted directly to neurology either from a clinic at the Royal Preston Hospital, or via an on-call SpR. In total, therefore, only 2.3% of the patients surveyed were admitted under neurology or neurosurgery.

The most common reasons for referral were seizures (28.3%), headache (19.6%) and cerebrovascular disease (17.4%). Details of the referrals and admissions are given in Tables 3, 4 and 5. Details of patients with neurological problems who were not referred are given in Table 6.

Neurological investigations

The use of neuroradiological and neurophysiological resources for acute admissions is outlined in Table 7. At the time of the survey there were no specific guidelines in place for utilisation of these resources; urgent investigations were arranged by discussion with the relevant consultants. Sixty-eight of the cranial CT scans (62%) were performed within 48 hours of admission. Six of the patients who underwent cranial MRI had not been referred to neurology. Only two of the carotid doppler studies showed stenoses of 50% or greater. The average wait for this investigation was 28 days (range 7–56 days).

TABLE 3 Referrals to neurology (n=37).

	Total	Admitted	OP appt	Advice only
Seizure/s (known & suspected)	13	2	9	2
CVA (known & suspected)	3	0	0	3
Headache with focal signs	3	0	1	2
Worsening headache	3	0	2	1
TIA (known & suspected)	2	2	0	0
MS relapse	2	2	0	0
Acute/episodic confusion	2	1	1	0
Ptosis	2	0	1	1
Leg weakness	2	0	0	2
Myaesthetic syndrome	1	1	0	0
Meningitis	1	1	0	0
Amnesia	1	0	1	0
Ataxia	1	0	0	1
Non-convulsive status	1	0	0	1

TABLE 4 Direct admissions to neurology (n=13).

MS relapse	3
CVA (known & suspected)	2
Progressive/fluctuating weakness	2
Hemifacial spasm	1
TIA (known & suspected)	1
Visual disturbances	1
Headache with focal signs	1
Neuromuscular respiratory failure	1
Myaesthetic syndrome	1

DISCUSSION

This paper presents the first comprehensive survey of acute neurological admissions to a district general hospital to be completed in over two decades. It differs from previous studies in concentrating on the working diagnoses reached by admitting clinicians, rather than the final diagnoses on discharge from hospital. In this way, it gives a clearer idea of the burden of acute neurological disease in inpatient practice that might be expected to fall on acute neurological services in the UK in the future.

In this study, 15% of medical admissions had a primarily neurological problem. This figure remains roughly in accordance with previous studies. In this district general hospital this equates to a figure of 1,270 patients/year. Even in a sub-regional centre such as Preston, where the number of neurologists has increased from one in the 1980s to six at the time of this audit, a significant proportion of the acute neurological workload continues to be managed by general physicians; these include patients across the entire range of neurological conditions, as shown in Table 6. Similar conclusions may be drawn from these figures as were drawn from a recent audit of the 24 hour intake neurology service at Derriford Hospital in Plymouth; that is, that implementation of the Association of British Neurologists' standards of care for patients with acute neurological disease, and of the European Working Time Directive, will require a significant increase in manpower at both consultant and SpR level.⁶ The quantity of

TABLE 5 Referrals to neurosurgery (n=9).

	Total	Admitted	Advice only
Thunderclap headache	3	3	0
CVA (known & suspected)	3	2	1
Leg weakness	2	0	2
Progressive/fluctuating weakness	1	1	0

neuroimaging and neurophysiological investigations generated by this number of admissions also has significant implications for staffing and resourcing a comprehensive acute neurological service. The figures presented above do not include emergency admissions to neurology or neurosurgery from elsewhere in the region (there were 15 of the former during the study period), or elective admissions to neurology (of which there were 268).

The percentages of patients referred and admitted in this study are in line with studies undertaken in other centres in the UK and Europe (Table 8).

The observation that definite or suspected cerebrovascular disease or epilepsy, along with headache, accounted for 78% of all neurological admissions to acute services, has significant implications when planning neurological services, both inpatient and outpatient. The introduction of stroke units and TIA/neurovascular clinics in many centres provides appropriate pathways of inpatient and outpatient referral for patients with known or suspected cerebrovascular disease.¹⁰⁻¹² First seizure clinics are also available in many centres,^{13, 14} though a recent audit undertaken at a district general hospital in Leeds indicates as many as 83% of patients may be lost to appropriate follow-up if direct referrals are not made from Accident and Emergency Departments.¹⁵ Acute headache services, on the other hand, are sparse or non-existent in many parts of the UK.

The pattern of acute neurological admissions should also be reflected in undergraduate and postgraduate training.

TABLE 6 Patients not referred to neurology or neurosurgery (n=122).

CVA (known & suspected)	38
Seizure/s (known & suspected)	35
TIA (known & suspected)	13
Worsening headache	9
Thunderclap headache	8
Headache with focal signs	4
Acute/episodic confusion	4
Meningitis	4
Progressive/fluctuating weakness	2
Dizziness	2
Leg weakness	1
Ataxia	1
Neuropathy	1

TABLE 7 Neurological investigations.

Cranial CT	109
Carotid dopplers	15
MRI brain	11
Conventional angiography	4
MRI spine	3
MR angiography	1
MR venography	1
CT angiography	1
EEG	10
EMG	1

TABLE 8 Seizures, cerebrovascular disease & headache as proportion of neurological referrals or admissions.

Location	Downpatrick	Mater	Derriford	Madrid	Granada	Preston	Preston
Admissions/referrals	admissions	referrals	admissions	referrals	referrals	referrals	admissions
Reference	[1]	[7]	[6]	[8]	[9]	this study	this study
CVD	28.3%	22.7%	29%	24.6%	23.7%	17.4%	34.3%
Seizures	26.7%	10.2%	12%	13.1%	13.7%	28.3%	26.5%
Headache	7.2%		13%	6.1%		19.6%	17.4%

Documents such as the Association of British Neurologists' recommendations for undergraduate training, and the American Academy of Neurology's neurology clerkship core curriculum, mention cerebrovascular disease, seizures and headache, but do not give medical students any clear guidance about the relative importance of these topics versus others listed.¹⁶

¹⁷ Likewise the Royal College of Physicians' *Core Curriculum for Senior House Officers* lists headache and status epilepticus in its inpatient neurology scenarios (stroke is listed under Geriatrics) and again (with some more details) in its outpatient scenarios, but without any guidance as above.¹⁸ There is little information available on how much training is given in the topics mentioned above, but the few studies that have been done indicate that coverage may be sparse.¹⁹⁻²¹

In conclusion, this survey provides important, contemporary information to support the drive for

expansion of acute neurological services in the UK, and reminds us that within this more general process, certain areas which in the past have been under-represented in the British neurological community (cerebrovascular disease, epilepsy and, particularly, headache) may require special attention.

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A LIGHT HEARTED COMMENT

Jennings' article on *Sudden Death in The Journal* (Jennings K. Sudden cardiac death. *J R Coll Physicians Edinb* 2006; **36**:117–0.) reminded me of the writings of William Boyd who was a Professor of Pathology at Toronto University in the mid-1940s. He was a Fellow of the Royal College of Physicians of London, a Member, and possibly a Fellow later, of the Royal College of Physicians of Edinburgh as well. His three text books, *Textbook of Pathology*, *Pathology for the Physician*

and *Pathology for the Surgeon* were a 'must' for any serious undergraduate and postgraduate student in the middle of the twentieth century.

In the fifth edition of his *Textbook of Pathology* published in 1947, he wrote in relation to sudden death at a time when electrocardiography was not available, 'Finally there remains a group of cases in which patients die of sudden heart failure, but no satisfactory cause can be found at autopsy. Such cases may be put down to shock, status lymphaticus or a visitation from God.'

Jennings, almost 60 years later, remarks that 4% of sudden deaths are not attributable to any cause. Shock and status lymphaticus would cause raised eyebrows among scientists, but a visitation from God could still be accepted until the pathological cause was found. This would be an interesting reminder of William Boyd, a very highly respected pathologist and medical author.

Satinder Lal
Retired Consultant in
General/Internal Medicine