The uptake and costs of guidelines for stroke in a district of southern England

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Abstract

Study objective—To assess the impact of guidelines for stroke management on the utilisation of services by patients and the cost consequences of implementation.

Design—Prospective audit.

Setting—District health authority in southern England

Patients—A total of 468 live non-comatose stroke patients registered between November 1991 and May 1993.

Main outcome measures—A comparison between the three, six month periods for investigations performed and rehabilitation received and their associated costs.

Results—The appropriateness of the use of investigations improved over time to between 88 and 92% except for computed tomography (CT) (24%). Younger, more severely impaired patients in a medical bed were more likely to have CT. Overall levels of rehabilitation were low. There was no change in use of physiotherapy (61% to 63%), a significant increase in occupational therapy (26% to 39%) and a non significant change in speech therapy (34% to 25%) over time. Guideline introduction caused a modest £23 increase in costs per patient in the 2nd six months and £41 in the 3rd six months but this sum could rise to £430 per patient if full implementation of the guidelines occurred which is still only around 13% of the costs of nursing care while in hospital.

Conclusions—This 18 month audit shows only modest changes in practice compared with guidelines, and overall levels of rehabilitation were low. The costs of full implementation seem considerable, but in fact constitute only a small proportion of nursing care costs.

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process and outcome of care in certain settings.⁴

As long ago as 1989, the Royal College of Physicians of London published guidelines for the management of stroke and subsequently produced a package for the audit of the process of care.^{5,6} However, the evidence to support each component of the guidelines is often lacking, with one of the main debates being around the use of computed tomography (CT).⁷ Further guidelines have recently been suggested by the World Health Organization which include recommendations regarding the use of CT and rehabilitation.⁸

In spite of these efforts to promote standardisation in the provision of stroke care, current evidence indicates that there is still large variation in the process of care between different hospital settings. A survey conducted in the United Kingdom by Lindley *et al*⁹ for the Stroke Association highlighted the haphazard nature of stroke care provision in the UK; patients were only rarely admitted to stroke units which have been shown to be of proven benefit,¹⁰ and the use of CT varied considerably. In a European study, Beech *et al*.¹¹ have shown that there are wide variations in the hospital lengths of stay, use of diagnostic investigations, and use of rehabilitation around Europe which are unexplained by case mix.

This paper describes the way guideline care was promoted in a rural district health authority of southern England and analyses its subsequent impact on the utilisation of services by patients. The cost implications of guideline care are also explored. Although the main purpose of guidelines is to improve the quality and outcome of care, it is important to assess their cost implications. These may effect both the feasibility and, where the efficacy of an intervention is still open to debate, the desirability of their introduction.

Methods

GUIDELINE DEVELOPMENT

A previous study had demonstrated the apparently haphazard nature of stroke care in the district health authority where the audit took place and the regional health authority provided funding for developing a model for the audit of stroke care.¹² A District Health Authority Stroke Standards Working Group was convened in November 1991 comprising representation from hospital physicians (care of the elderly, medicine), hospital and community nurses and therapists (occupational, speech and physio therapy), general practice, management, audit, and public health. Stand-

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Acute stroke care is estimated to cost around 4-5% of the NHS budget in the UK, and as the population ages it has been predicted that the burden of patient care for the acute stroke episode will increase by 30%.^{1,2} In The Netherlands it has been estimated that the lifetime direct costs of stroke are £73 000, of which 45% accounts for first year hospital costs.³

Health care services around the world are attempting to control such escalating costs by providing only those elements of a service considered to be effective. The development of practice guidelines, based on evidence of effectiveness, has been shown to affect both the

Table 1 Guidelines audit over 18 months

CT scan:
- to confirm a diagnosis if in doubt
- to determine feasibility of anticoagulation
Full blood count
Urea and electrolytes
Glucose
Chest x ray
Electrocardiogram
Physiotherapy assessment within 48 hours of referral
Occupational therapy assessment within 72 hours of referral
Speech therapy assessment within 7 days of referral for dysphasia/dysarthria
Speech therapy assessment within 72 hours of referral for dysphagia

ards were developed based on the Royal College of Physicians guidelines,⁵ and those set by the West Lambeth Stroke Steering Group.¹³ The group met on seven occasions, agreeing standards by August 1992.

The standards covered aspects of the prevention and management of stroke. Table 1 indicates the basic investigations considered appropriate for all stroke patients wherever managed. The CT scan standard stated "that a CT scan should be requested to confirm a diagnosis if this in doubt or to determine the feasibility for anticoagulation. A CT scan is not required if the diagnosis is clear, the patient is terminally ill, has had a previous stroke or has a serious medical condition or where a diagnosis of significant dementia has been made". This standard is difficult to quantify and therefore whether CT was performed in patients who were not in coma is presented in the results. Recording whether a scan was performed on all non-comatose patients would also enable the CT standard outlined in the WHO Helsingborg declaration for acute care to be assessed.⁸ The rehabilitation standards (table 1) for patients with the relevant impairment were: physiotherapy assessment within 48 hours, occupational therapy assessment within 72 hours, speech therapy assessment for patients with dysphasia/dysarthria within seven days, and with dysphagia within 72 hours.

DATA COLLECTION

To monitor the impact of guidelines on the process of care a district stroke register collected data for the audit between November 1991 and May 1993 using several sources of notification.¹² The data were analysed over three, six month periods: period 1, from November 1991 to May 1992, represented the baseline situation; period 2, from May to November 1992, covered the phased introduction of guidelines; and period 3, November 1992 to May 1993, the time when guidelines for care were fully available. All general practitioners (125), district nurses, rehabilitation personnel in hospital and the community, and hospital accident and emergency, medical, and geriatric departments were regularly contacted for notifications of stroke patients.

The World Health Organization definition of stroke was used for all cases of first or recurrent strokes.¹⁴ Information to monitor the achievement of standards was collected from either the patients, their carers, or from someone within the hospital or general practice. Data collection

KEY POINTS

- There is inequity in the diagnostic tests offered and rehabilitation provided to stroke patients which guideline implementation might improve.
- Guideline development can be lengthy and guidelines are often difficult to measure for audit.
- Despite guideline dissemination, the use of computed tomography and rehabilitation assessment and treatment remained low.
- The cost of implementing simple guidelines would increase current expenditure 10 fold but would represent only a 13% increase in inpatient nursing costs.

covered the date of stroke, demographic details (age, sex, living conditions) and clinical details of maximal impairment after stroke (level of consciousness, paralysis, speech, swallowing, and urinary impairment). The process of care was documented and included whether the patient was admitted to hospital, type of hospital bed, length of stay, use of guideline investigations, and the number of formal contacts with rehabilitation staff. Patients who died on the same day as their stroke and patients in coma were excluded from the audit. For the audit of rehabilitation only patients with a paralysis, speech, or swallowing impairment were included. A stroke clerking sheet was developed for use by hospital staff to act as an aide-memoire as well as a source of information for the audit.

To allow an assessment of the cost implications of introducing guidelines, unit cost data for investigations and rehabilitation sessions were obtained from the local hospital finance department. These unit costs are given in tables 3 and 5.

The audit costs were met by a grant from the Regional Audit Committee for £55 073 over three years, which funded a research associate's salary, the cost of data collection stationary, data entry, and travel costs but not the time for the guideline development or audit meetings which were financed by the hospital as part of the audit programme. The audit research assistant (ER) and supervisor (CW) met with the hospital physicians at dedicated half day audit meetings every six months from May 1991 until May 1993 in order to provide regular feedback of the audit data.

ANALYSIS

Comparison between the patient groups covered by the three, six month periods for analysis was with the χ^2 test and trends over time for admission to hospital, investigations performed, and rehabilitation services received with the χ^2 test for trend. The Kruskal-Wallis test was used to compare lengths of stay over time and by type of bed.

The association of patient demographic and clinical characteristics with the investigations performed and receipt of rehabilitation was estimated with multiple logistic regression and

Table 2 Demographic and clinical features of audit population

	1st 6 months No (%)	2nd 6 months No (%)	3rd 6 months No (%)	p value
Age (y)				
0-64	25 (14)	33 (22)	18 (13)	0.134
65-74	39 (22)	24 (16)	33 (23)	
75+	111 (63)	92 (62)	93 (65)	
Total	175	149	144	
Sex:				
Male	62 (35)	60 (40)	57 (40)	0.62
Female	113 (65)	89 (60)	87 (60)	
Paralysis	167 (95)	139 (93)	133 (92)	0.83
Incontinence/catheterised	26 (15)	32 (21)	19 (13)	0.06
Swallowing impairment	38 (22)	52 (35)	53 (37)	0.002
Speech impairment	124 (71)	114 (77)	110 (76)	0.1

Table 3 Utilisation of investigations and their costs by six month periods

Investigation (cost)	1st 6 months* No (%)	2nd 6 months* No (%)	3rd 6 months* No (%)	p value
Computed tomography (£148.88)	32 (18) (£4 764)	35 (23) (£5 211)	34 (24) (£5 062)	0.26
Full blood count (£2.30)	144 (82) (£331)	130 (87) (£299)	133 (92) (£306)	0.09
Urea and electrolytes (£2.65)	144 (82) (£382)	130 (87) (£345)	129 (90) (£342)	0.20
Glucose (£2.90)	125 (71) (£363)	129 (87) (£374)	127 (88) (£368)	0.0004
Chest x ray (£11.97)	125 (71) (£1 496)	124 (83) (£1 484)	126 (88) (£1 508)	0.0012
Electrocardiogram (£84.00)	120 (69) (£10 080)	120 (81) (£10 080)	127 (88) (£10 668)	0.0001

*Total cost for time period.

variables selected by backwards stepwise procedure with significance set at the 5% level. The variables considered were: age (<65, 65-74, 75+ years), sex, type of bed (medical, geriatric, other, not admitted), time period (1st, 2nd, and 3rd, six month period) and incontinence. For physio and occupational therapy only patients with an impairment were included, and for speech therapy only those patients with a speech or swallowing impairment were included.

For each period the overall costs of investigations and sessions were estimated, these costs being the product of the unit costs per investigation or session and the number of patients who actually received guideline care. The cost of full guideline implementation was calculated in the same manner based upon the following assumptions about the shortfall that existed in the number of patients who had received guideline care. For investigations it was assumed that every patient covered by the audit should have received guideline care. Patients were considered eligible for physio and occupational therapy if they had an identified site of paralysis. Eligibility for speech therapy was based upon an identified speech or swallowing problem. Two alternative assumptions were made in calculating the impact of full guideline implementation on the costs of therapy. The first assumption was that eligible patients who had not received therapy would have only received an assessment session under full guideline implementation. The second, probably more realistic assumption, was that this assessment would have then led to patients receiving the current average number of therapy sessions per patient.

Using period 1 as a baseline, the marginal changes in cost per patient were estimated both

for actual practice during periods 2 and 3 and assuming full guideline implementation. The denominators used in assessing the cost per patient were the total patient sample for the relevant period and for full guideline implementation, the total patient sample for the three periods combined. To set these marginal changes in cost per patient within the context of the broader costs of care they were compared with the average cost of inpatient ward nursing care per stroke admission. Unit nursing costs per bed day were obtained from the local hospital finance department.

RESULTS

Four hundred and sixty eight stroke patients were registered for the audit during the study period, 394 (84%) were admitted to hospital, 47 (10%) were not admitted, and 27 (6%) had a stroke while in hospital, with no significant difference over the audit time period ($p=0.65$). Table 2 shows the demographic and clinical features of the patients.

There were 223 (53%) patients admitted to a medical bed, 170 (40.5%) to a geriatric bed, with 27 (6.5%) admitted to another type of bed and these proportions did not change significantly over time ($p=0.67$). Age was a significant predictor of bed type, with 86% of those under 65 admitted to medical beds and 4% to care of the elderly beds ($p<0.0001$). Patients aged 75 and over were admitted to medical (40%) or care of the elderly beds (55%).

The overall median length of stay was 28 days (mean(SD) 39(39.6)) in the 1st period, 32 (mean 46(43)) in the 2nd, and 27 (mean 39.9(37.8)) in the 3rd ($p=0.54$). The median length of stay in a medical bed was 23 days compared with 36 in a geriatric bed and 32 days in other types of bed ($p<0.004$). The total bed days were 5933 in the 1st period, 6751 in the 2nd, and 5623 in the 3rd.

Table 3 indicates the patients who had the appropriate investigations in each time period. Type of bed alone was predictive of whether full blood count, urine and electrolytes, and chest x ray were performed (geriatric beds less likely), and time period (3rd time period more likely) and type of bed (geriatric bed less likely) of whether a blood glucose test and electrocardiogram (ECG) were carried out. Relative to period 1, the introduction of guidelines caused a significant increase in the percentage of patients who had glucose, chest x rays, and ECGs, while the percentage of patients who received a full blood count and urine and electrolyte investigations increased from a relatively high baseline. Although showing a slight increase, the percentage of patients who had CT remained relatively low throughout the study period. Backwards stepwise logistic regression identified paralysis, speech impairment, age, and type of bed as independent predictors of whether CT was performed (table 4).

The overall proportion of patients receiving physiotherapy who had an impairment did not change over time, while the proportion of patients receiving occupational therapy who had an impairment significantly increased ($p=0.013$). The proportion of patients receiving

Table 4 Predictive factors of having a computed tomogram

Predictive factor	Odds ratio (95% CI)	p value
Paralysis		
Yes	1.00	
No	4.45 (1.42, 13.96)	0.0047
Speech problem		
Yes	1.00	
No	1.68 (0.93, 3.04)	0.007
Age		
0-64	1.00	
65-74	0.33 (0.16, 0.66)	<0.0001
75+	0.09 (0.05, 0.19)	
Type of bed		
Medical	1.00	
Geriatric	0.66 (0.34, 1.25)	0.006
Other	0.82 (0.29, 2.34)	
Not admitted	0.12 (0.03, 0.55)	

ing speech therapy who had a speech or swallowing impairment decreased over time, but the change was non significant (table 5). For each type of therapy the results indicate unmet need.

Of those with paralysis who received physiotherapy, the proportion of inpatients seen within 48 hours increased over time from 96% (97 of 102) in the 1st six months to 100% (84 of 84) in the 3rd. The proportion of outpatients seen within 48 hours also increased from 8% (1 of 13) in the 1st six months to 27% (3 of 11) in the 2nd period and 54% (7 of 13) in the 3rd period. Of those patients with a paralysis receiving occupational therapy the proportion of inpatients seen within three days did not change between the three, six month periods—74% (32/43) 1st six months, 79% (38/48) 2nd six months, 73% (38/52) 3rd six months.

The proportion of inpatients with dysphasia/dysarthria seen within seven days decreased with time, from 95% (35 of 37 patients with impairment) in the 1st six month period to 92% (22 of 24) and 86% (12 of 14) in the 2nd and 3rd periods respectively. The proportion of inpatients with dysphasia seen within three days increased from 55% (6 of 11) in the 1st six months to 79% (11 of 14) and 83% (5 of 6) in the 2nd and 3rd periods respectively. All outpatients were seen within 13 weeks in all three, six month periods.

Backward stepwise logistic regression identified those factors predicting receipt of therapy for patients with the relevant impairment: paralysis for physiotherapy (table 6) and occupational therapy and speech/swallowing impairment for speech therapy. The significant predictors of receipt of occupational therapy were lack of a swallowing impairment, medical bed, time period (increase over time). The only significant predictor of speech therapy was being in a medical bed.

Table 6 Predictors of receipt of physiotherapy

	Odds ratio (95% CI)	p value
Speech problem		
Yes	1.00	
No	0.57 (0.33, 0.987)	0.022
Swallowing problem		
Yes	1.00	
No	2.55 (1.57, 4.14)	0.0052
Age:		
<64	1.00	
65-74	2.27 (1.09, 4.76)	0.01
75+	2.59 (1.35, 4.97)	
Type of bed		
Medical	1.00	
Geriatric	0.53 (0.32, 0.87)	<0.0001
Other	0.75 (0.29, 1.96)	
Not admitted	0.03 (0.01, 0.09)	

For each time period tables 3, 5, and 7 indicate the actual spending on the interventions and therapy sessions covered by the guidelines. Actual spending is the product of the unit costs and the number of patients receiving guideline care. For therapy the total costs cover both the initial and follow up sessions received by patients. Mean sessions received per patient were 14.5 for physiotherapy, 5.3 for occupational therapy, and 1.5 for speech therapy.

Total cost figures are summarised in the first three rows and columns of table 7. Also given are two alternative cost figures for full guideline implementation. Both assume that the total patient sample (468 patients) should have received guideline interventions. The penultimate column assumes eligible patients who did not receive therapy would have only received an assessment session. These additional patients numbered 168 for physiotherapy, 296 for occupational therapy, and 255 for speech therapy. The final column assumes that assessment would have led to these patients receiving the mean number of therapy sessions.

Figures in table 7 indicate overall average costs per patient in each time period for the elements of care covered by the guidelines and for the alternative full implementation estimates. Relative to the value in period 1, the figures in the final row of table 7 indicate the actual and potential impact of guidelines on average costs per patient. Guideline introduction actually caused a modest rise in average patient costs, £23 in period 2 and £41 in period 3, but this increase could rise by an estimated £430 per patient given full implementation.

These average cost increases need to be set in the context of the broader costs of stroke care. At the study hospital nursing costs per bed day are currently £92.50 for geriatric ward care and £83 for medical ward care. In the study population, the mean patient stay for stroke patients treated in geriatric beds was 45.97 days and that for medical beds was 32.03 days. Hence, at current prices, mean nursing costs per stroke case assigned to geriatric care were around £4250 and those per case assigned to medical care were around £2660. Given the mix of admissions in the study population, mean nursing costs per case were estimated as £3300. Hence the largest estimated increase in cost per case resulting from guideline care

Table 5 Patient utilisation of rehabilitation and associated costs by six month period

Investigation (session cost)	1st 6 months*	2nd 6 months*	3rd 6 months*	p value
Physiotherapy received (£43 initial) (£32 follow up)	102 (61%) (£48 450)	85 (61%) (£40 375)	84 (63%) (£39 900)	0.72
Occupational therapy received (£25)	43 (26%) (£5 698)	48 (35%) (£6 360)	52 (39%) (£6 890)	0.013
Speech therapy (£21.50)	44 (34.4%) (£1 419)	33 (27.7%) (£1 064)	28 (24.8%) (£903)	0.24

*Total cost.

Excludes sudden deaths and coma and includes only those with relevant deficit.

Table 7 Cost of guideline care

Guideline interventions	1st period (£)	2nd period (£)	3rd period (£)	Full implementation (£)	Full implementation assess + sessions (£)
Overall cost of investigations (£)	12 652	12 582	13 192	48 587	48 587
Overall cost of CT (£)	4 764	5 211	5 062	69 676	69 676
Overall cost of rehabilitation assessment (£)	55 567	47 799	47 693	171 166	278 303
Total cost of guideline care (£)	72 983	65 592	65 947	289 429	396 566
Unit cost of guideline interventions per patient (£)	417	440	458	618	847
(number of patients)	(175)	(149)	(144)	(468)	(468)
Marginal change in cost per patient (£)	0	+23	+41	+201	+430

CT=computed tomogram.

(£430) is only around 13% of the costs of inpatient nursing care.

Discussion

Although there is an increasing use of audit within the health care professions, the consequences of guideline implementation on practice over a sustained period of time, and the implications for the cost of the service, have not often been addressed concurrently. This audit was conducted over an 18 month period allowing adequate time for regular review of the data by all the health care professionals involved in the audit. The audit was funded by a regional audit programme to develop a model for stroke audit and the audit itself was not without resource implications. In order to obtain the information for this audit junior hospital doctors completed clerking proformas from which a research nurse, employed full-time, abstracted the data. Without such a resource it would require the time, training, and commitment of members of the health care professionals managing the stroke patients to input the data and analyse it, and it is doubtful, in our opinion, whether this is feasible. The estimated cost of data collection was £118 per case, which is expensive in comparison with £44 for patients assessed at 3 months after prostatectomy in the United Kingdom.¹⁵ The additional costs of developing the guidelines and reporting back the results at audit meetings was not estimated but was considerable and should be a part of the ongoing contracted audit activities of a provider unit with their purchasing authority. It could be argued that hospitals could generate computerised proformas to collect the data on a routine basis and that audit departments could subsequently analyse the data and feed it back to health care professionals. Although this may be feasible in some units, it does require extra resource, in terms of training, computer programming and data entry time but is arguably part of the process of audit that should be ongoing.

Whether or not the development of guidelines and the introduction of measures such as

audit to aid their implementation are worthwhile essentially depends upon the impact that guidelines will have upon the quality and outcomes of care. In the United Kingdom, standards for the management of stroke patients have been recommended by the Royal College of Physicians of London,³ an audit package has been produced, and more recently guidelines have been generated by the World Health Organization.^{6,8} These standards are based wherever possible on scientific evidence but for much of stroke care the evidence is not strong. Grimshaw *et al*⁴ reviewed the evidence for the development and implementation of clinical practice and concluded that although guidelines can be used to help change clinical practice, their adoption is not automatic and will depend on various factors particularly their validity. Validity depends on how well evidence is identified, synthesised, and incorporated into the guidelines. As the evidence for the use of the specific investigations for stroke care have not been shown in a controlled setting to alter outcome, particularly the use CT, the impetus for health care professionals to adhere to the guidelines may be weakened.^{5,7}

One method of improving adherence to guidelines may be by gaining local ownership, although the evidence for this is conflicting.⁴ The District Stroke Working Party met on seven occasions to agree standards, which were also discussed at departmental audit half days. There was consequently adequate discussion and dissemination of the standards. The junior hospital medical staff completed the stroke clerking sheet for most patients and they considered them to be educationally useful, but despite their increasing use over the audit period the processes of care did not change significantly for many key elements of care and varied considerably between different groups of patients.

These guidelines represent the main processes of care considered by the stroke working group. It proved difficult to measure some of the standards, particularly that for use of CT scans which was not explicit with regard to inclusion and exclusion criteria. The audit was unable to adequately collect detailed information to assess whether a patient had a "serious comorbidity" and the "severity" of the stroke as there are no easily administered scales for these parameters for stroke. The severity indicators measured, such as incontinence, paralysis and speech/swallowing problems, although valid at a group level, do not enable the appropriateness of CT to be assessed at an individual level. There is still considerable variability in the UK in the uptake of CT⁹ and debate over its effectiveness.⁷

The level of adherence to the investigation guidelines only improved significantly for glucose concentration, chest x ray, and ECG but was high overall for all tests except CT. The CT rate increased from 19% to 24% over the 18 months. Lindley *et al*⁹ found in the UK that one third of all stroke patients were admitted to a hospital without on-site CT facilities. This hospital had on-site facilities but uptake was relatively low compared to a contemporary

study in Europe, in which Beech *et al*¹¹ observed CT scan rates as high as 98%. There appeared to have been systematic reasons why patients did not have a CT scan. Older patients and those not on medical wards were significantly less likely to be scanned, as were those with paralysis. For the other investigations it also appeared that being in a geriatric bed reduced the chances of being investigated.

The evidence that early physiotherapy has a beneficial effect on outcome is relatively strong.¹⁶ For speech and occupational therapy the evidence is, however, not so clear cut.¹⁶ The guidelines for the receipt of rehabilitation assessment in this audit are based on local good practice. Overall, the proportion of patients with an impairment that were assessed within the standard time was very low, particularly if the patient was not admitted to hospital. These data confirm previous findings in the same study area in a population based study.¹² There appeared to be a reduced chance of receiving rehabilitation if admitted to a geriatric bed. Despite the guidelines there is an inequity in access to the rehabilitation services which might be overcome by having a dedicated stroke physician, multidisciplinary ward rounds and a stroke unit.

We have not assessed the relation between adherence to guidelines and outcome in this study, but as the process of care changed very little it is unlikely to have had an effect on outcome as assessed by mortality and disability.

In a postal survey, Mansfield¹⁷ demonstrated that 77% of responding clinicians expressed welcoming attitudes towards guidelines. The reasons cited for the failure of guidelines to be implemented included unawareness of their existence, poorly developed guidelines, and lack of encouragement for their use by senior clinicians. In this audit it was considered that these obstacles had been addressed, but adherence was still poor. However, the validity of such guidelines without the supporting evidence may have been a factor. Grimshaw and Russell⁴ outline some strategies which could improve the likelihood of guideline implementation. These include patient specific reminders at the time of consultation and stronger links with continuing medical education.

There have been previous studies assessing the effect of stroke protocols on hospital costs. Bowen and Yaste,¹⁸ in an urban American hospital, compared historical and concurrent controls and found that protocols reduced the hospital charges due mainly to reduced lengths of stay in the protocol group. Another study in America showed similar reductions in length of stay and costs with the implementation of clinical pathways.¹⁹

In this paper average cost figures have been used to explore the cost implications of guidelines. As previous research has demonstrated actual changes in spending would depend upon factors such as whether or not the increased services received by patients meant extra staff and equipment needed to be purchased.²⁰ In this example, the introduction of guidelines only led to a modest predicted rise in average costs. To a large extent this was due to the low

adoption of guideline care but even full implementation of guidelines was predicted to have relatively small cost consequences. In the opinion of the authors such small rises in overall patient costs should not represent a barrier to the introduction of guideline care for stroke. However, in situations where the cost consequences of guideline adoption are greater the need for good quality clinical evidence to support the guidelines is also greater. For this reason it is important that the revenue consequences of guidelines are always assessed as part of their planned introduction.

In summary, this audit of common aspects of stroke management over an 18 month period has shown that despite local development and feedback, adherence to guidelines is relatively poor. There was also little improvement over time with a considerable amount of unmet need. Because of the low levels of adherence to guidelines the costs of implementation was relatively modest but full implementation would add 13% to the cost of care.

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