

# Staffing levels and patient dependence in English stroke units

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**ABSTRACT** – Little research has been performed to determine how a stroke unit should be staffed and what the links are between patient dependency and staffing. For this study, 140 stroke units were randomly selected – 35 from each of the four quartiles of performance in the National Sentinel Audit of Stroke. A questionnaire was sent to each of the units to collect data on patient numbers and dependency, staffing numbers and therapy, and nursing contact times on a single weekday. The response rate was 66% (92 sites) and information on 1,398 patients was provided. The median number of beds was 18 (interquartile range 12–24). Staffing levels per 10 beds were a median of 10.9 nurses, 1.7 physiotherapists, 1.3 occupational therapists and 0.4 speech and language therapists. Of the patients, 74% received physiotherapy, 46% occupational therapy and 25% speech and language therapy during the day with median contact times being 170 minutes for nursing, 40 minutes for physiotherapy, 45 minutes for occupational therapy and 30 minutes for speech therapy. There was a weak correlation between patient dependency and contact time with nurses and therapists. Stroke patients in England receive relatively little rehabilitation from therapists and there is a wide variation in the amount of nursing time each patient receives.

**KEY WORDS:** dependency, intensity, rehabilitation, staffing, stroke, stroke units

## Introduction

Stroke is a major health burden, costing the NHS and the economy about £7 billion a year.<sup>1</sup> Multi-disciplinary rehabilitation in an inpatient stroke unit results in lower mortality, lower disability and reduced need for institutionalisation compared with care on general wards.<sup>2</sup> While the effectiveness of organised stroke unit care is well recognised, understanding of the determinants of outcome from inpatient stroke rehabilitation is limited.<sup>3</sup> In particular, optimal workforce numbers and skills to provide best clinical outcomes have not been defined and there are large variations in the numbers of nurses, junior doctors and therapists employed on stroke

units in the UK that are unlikely to be explained on the basis of case mix alone.<sup>4</sup>

It is difficult for providers and commissioners of stroke care to gather evidence on which to base their staffing levels in stroke units. Data from the Royal College of Physicians' National Sentinel Stroke Audit report 2006, from the combined results of the Stroke Unit Trialists' Collaboration and from a survey by the British Association of Stroke Physicians (Table 1), provide descriptions of staffing levels but do not attempt to relate them to patient dependency levels.<sup>4–6</sup> A survey was therefore conducted to inform the workforce recommendations in the Department of Health (DH) Stroke Strategy.<sup>7</sup> The aims of the survey were:

- 1 to identify current staffing levels, and associated patient dependency levels, in a sample of English stroke units
- 2 to explore the relationships between staffing levels, patient contact times and patient dependency levels
- 3 to obtain an estimate of additional staffing required to deliver an ideal standard of stroke care.

## Methods

The Clinical Effectiveness and Evaluation Unit (CEEU) of the Royal College of Physicians (RCP) invited the lead clinicians in 140 stroke units to participate in a survey of staffing levels and patient dependency. The approached sites were drawn equally from the quartiles of performance for organisation of care in the 2006 National Sentinel Audit of Stroke. Those clinicians that agreed to participate downloaded the survey questionnaire from the RCP website, completed it on any given day within a specified two-week period, and returned it by post to the CEEU.

The survey was designed by the DH and CEEU Stroke Workforce Group to provide a pragmatic cross-sectional snapshot of staffing and patient dependency levels in stroke units across England, and was designed to take as little time to complete as possible.

The survey was divided into two sections:

- Patient dependency: respondents were asked to return data for each patient on their unit on

that day, completing the Barthel scale and Rehabilitation Complexity Scale (RCS). The RCS is designed to reflect the complexity of needs for patients undergoing rehabilitation, and is made up of four different subscales: basic care and support needs (range 0–3), nursing interventions (range 0–3), intensity of total therapy intervention (range 0–6), and medical intervention (range 0–3).<sup>8</sup> A summed score out of 15 was determined for each patient and scaled so that 1.0 is equivalent to the maximum summed score of 15. Respondents were asked to state if each patient was designated ‘for active rehabilitation’: this was intended to identify those patients where the decision had been made not to continue active rehabilitation (for example, those awaiting institutional placement, or palliative care). We also asked for the contact time, in minutes, of nursing, physiotherapy, occupational therapy, and speech and language therapy staff with each patient surveyed.

- Staffing level information: respondents were asked to supply the total number of hours spent by staff (qualified and assistants) – in the four disciplines of nursing, physiotherapy, occupational therapy, and speech and language therapy – on the management of stroke patients within the previous 24 hours and the establishment levels for the unit in whole time equivalents (WTE) (including funded but vacant posts). They were also asked to provide a pragmatic estimate of the number of additional hours of staff time in the 24-hour period, if any, required to provide best care, based on their own and their team’s specialist clinical knowledge of stroke care.

Statistical analysis was performed with SPSS version 15.0, using non-parametric measures.

## Results

In total 92 stroke units, based across 57 English NHS trusts, returned data on their facilities, staffing levels, patient contact

times, and patient characteristics from a total of 140 units contacted (response rate 66%). In total, 1,398 patients were included in the survey. Some sites collected data on a day of unusually severe weather which caused transport disruption throughout England. However, we found no significant difference in staffing levels (patient contact time) on this day compared to the others.

Rates of missing data are reasonable (about 5–10% or one patient per average stroke unit) throughout. However, some sites had difficulty gathering information on particular questions, and where variation in patient characteristics or nurse/therapist patient contact time between sites is described below, any sites with fewer than five valid cases in a particular question are excluded. These data are, however, included in any overall national figures. The overall RCS can only be calculated if all four components are present, and this is therefore valid for 1,313/1,398 patients.

Two stroke units reported that physiotherapy departments had refused to supply information on time spent by their staff on the stroke unit. These are excluded from the analysis as missing data.

### Stroke unit facilities

The sample included 24 acute stroke units (26%), 33 rehabilitation stroke units (36%), 32 combined stroke units (35%), two neurological rehabilitation units (2%), and one unit refused to declare a type (1%).

The median overall number of beds per stroke unit was 18 (interquartile range (IQR) 12–24). The median number of beds per unit that were occupied on the day of the survey by non-stroke patients was two (IQR 0–5). The survey only looked at patients on the stroke unit, and where outliers on other wards were reported, they were not entered into the analysis. The median number of beds per site (which can be more than one unit) was 25 (IQR 21–32), which is comparable to the figure for England in the RCP organisational audit 2006 of 24 (IQR 18–31),

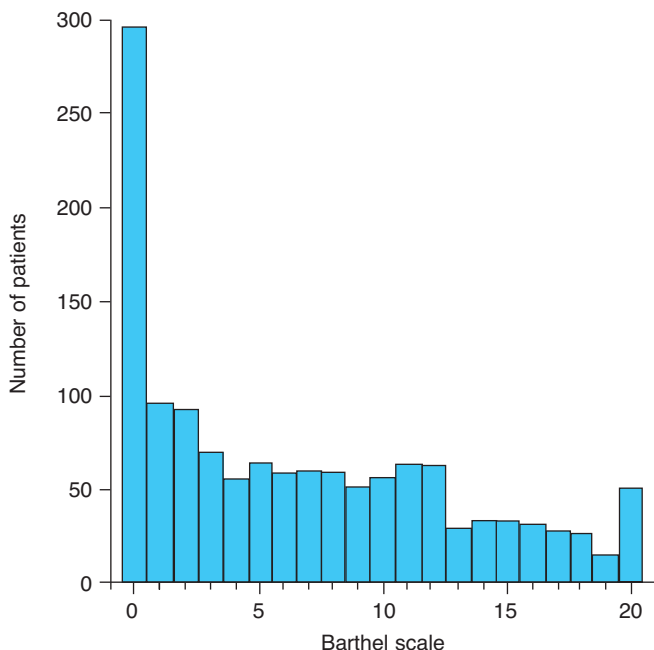
**Table 1. Staffing levels from the Royal College of Physicians’ (RCP) Sentinel Audit of Stroke, the Stroke Unit Trialists’ Collaboration (SUTC), and the British Association of Stroke Physicians’ Survey of acute stroke units (ASUs) and stroke rehabilitation units (SRUs), in whole time equivalents per 10 beds.**

Discipline	RCP 2006 (staff on duty)	SUTC (establishment)	BASP ASU (establishment)	BASP SRU (establishment)
Nursing staff	(3.3 on duty/10 beds)	7–12	8.0	10.1
Sister (F/G/H)	–	–	1.2	0.8
Staff (D/E)	–	–	3.3	4.2
Unqualified (A/B/C)	–	–	4.0	4.8
Physiotherapy	1.3	1–2	0.9	0.8
Occupational therapy	1.0	0.9–1.3	0.7	0.6
Speech and language therapy	0.3	0.2–0.6	0.35	0.25
Social work	–	0.4–0.7	–	–
Psychology	0	–	–	–

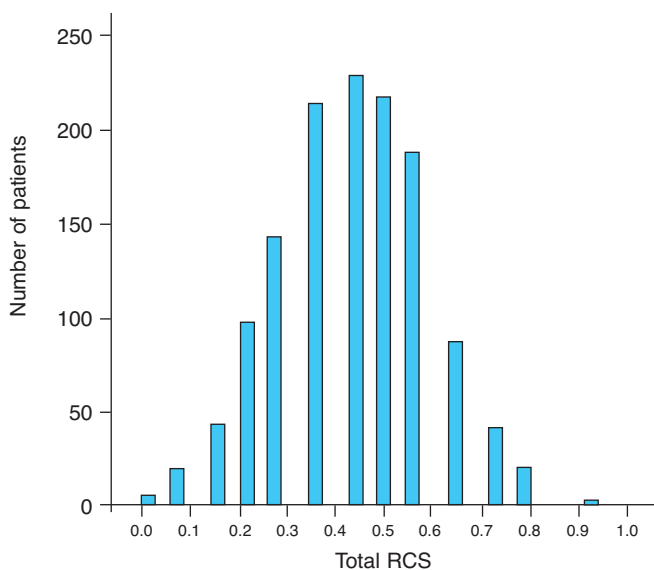
**Table 2. Staffing levels in whole time equivalents per 10 beds.**

Discipline	Units supplying data (n)	Median	IQR	Percentage qualified (%)
Nursing	76	10.9	9.3–13.1	54
Physiotherapy	78	1.7	1.2–2.1	75
Occupational therapy	77	1.3	0.8–1.6	77
Speech and language therapy	73	0.4	0.2–0.6	100

IQR = interquartile range.



**Fig 1. Distribution of dependency by Barthel scale.**



**Fig 2. Distribution of dependency by total Rehabilitation Complexity Scale (RCS) (scaled to range 0 to 1.0).**

indicating the representativeness of this sample. The overall median number of patients per stroke unit on the survey day was 15 (IQR 10–21).

**Staffing levels**

Staffing levels, in WTEs per 10 beds, including percentages of qualified staff for the four disciplines, are shown in Table 2. For each of the four professions included, the total staffing per 10 beds and total patient contact time were compared to each participating unit’s organisational and process scores from the RCP stroke audit. No association between any of these was evident.

**Patient characteristics**

The median patient age was 78 years (IQR 69–85, range 27–98, n=1,372). Time since stroke was 0–72 hours for 69 patients (5%), 3–7 days for 169 patient (12%), and more than 7 days for 1,157 patients (83%). Distribution of dependency as measured by the Barthel scale (n=1,339) is shown in Figure 1, and as measured by the RCS (n=1,313) is shown in Figure 2.

**Patient contact time from nurses and therapists**

Of the 81% (1,120/1,387) of patients identified for active rehabilitation, 86% (963/1,120) received some contact with therapists on the day of the survey. For those not identified for active rehabilitation, this figure was 54% (145/267).

The percentage of patients within each stroke unit receiving some contact from the named professions is shown in Table 3, and the patient contact times reported for all these patients is

**Table 3. Variation between stroke units in terms of the percentage of patients receiving any contact from professionals.**

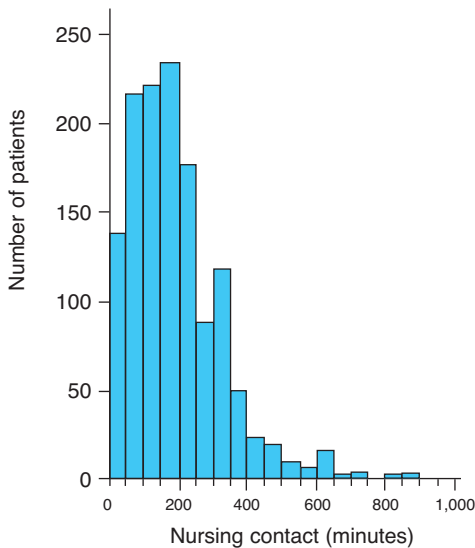
Discipline	Units (n)	Median (%)	IQR (%)
Nursing	85	100	100–100
Physiotherapy	85	74	59–90
Occupational therapy	85	46	33–63
Speech and language therapy	85	25	9–41

IQR = interquartile range.

**Table 4. Patient contact time with professionals (minutes).**

Discipline	Patients with some contact (n)	Median	IQR
Nursing	1,338	170	90–250
Physiotherapy	897	40	30–60
Occupational therapy	614	45	20–60
Speech and language therapy	328	30	20–45

IQR = interquartile range.

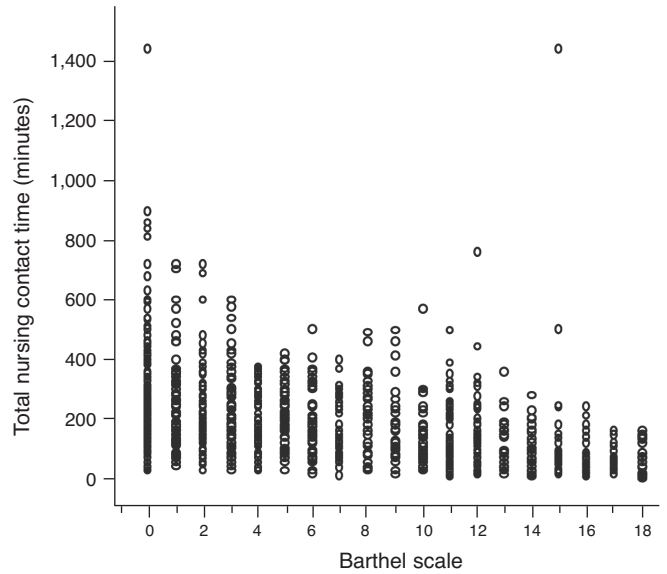


**Fig 3. Total nursing contact time per patient over a 24-hour period (truncated for clarity).**

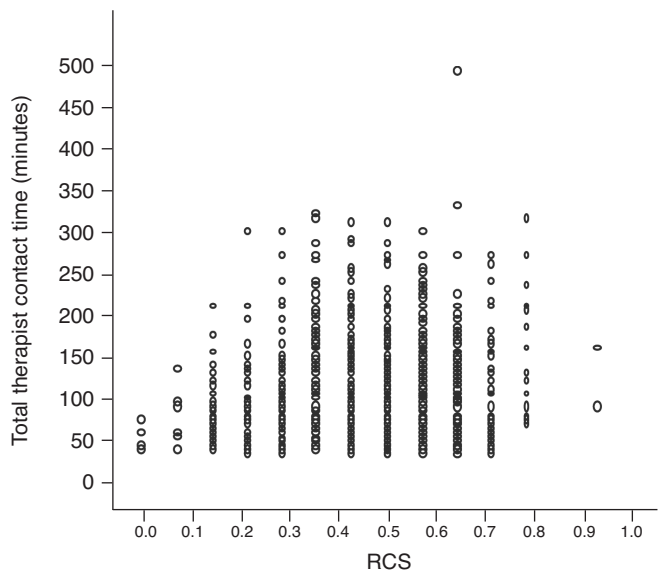
shown in Table 4. The histogram in Figure 3 shows the distribution of nursing contact times for all patients: the pattern of a long ‘tail’ of higher contact times in a few patients was also typical of the therapies. We examined possible correlations between total contact time and dependency: nursing time against the Barthel scale (Fig 4, Spearman’s  $\rho = -0.50$ ,  $p < 0.001$ ) and therapist time against the RCS (Fig 5, Spearman’s  $\rho = 0.23$ ,  $p < 0.001$ ). The Spearman’s  $\rho$  statistic reaches significance but Figures 4 and 5 show that there is only a slight increase in contact time with increasing dependency, and much variation between patients.

Explored possible predictors of patient contact time were time since stroke, RCS and Barthel scale. Table 5 shows that results were mixed with no clear associations other than the two correlations described above.

Bands 2 and 5 were the most common grades of nursing staff providing patient contact, followed by 6 and 7. For physiotherapists, the most common grades were 6 and 7. For occupational therapists, the most common grade was 6. For speech and language therapists, the most common grade was 7. Details of additional staff time required to provide best stroke care are shown in Table 6.



**Fig 4. Association between 24-hour nursing contact time and dependency (Barthel scale) per individual patient.**



**Fig 5. Association between 24-hour therapist contact time and dependency (Rehabilitation Complexity Scale (RCS)) for individual patients.**

**Conclusions**

This is the first detailed survey of English stroke unit staffing levels and patient dependency. As such it provides potentially useful data for hospitals wishing to establish a specialist stroke service or review staffing levels in an existing service.

A large proportion of patients on English stroke units are highly dependent for activities of daily living. Half of patients have a Barthel scale of 5/20 or less and 22% are completely dependent, with a Barthel scale of 0. The complexity of the rehabilitation needs of this group, as measured by the RCS, shows

**Table 5. Median patient contact times across possible determinants.**

	Nursing	Physio-therapy	Occupational therapy	Speech and language therapy	Total for all three therapies
<b>Time since stroke</b>					
0–72 hours	185	40	30	38	58
3–7 days	145	45	40	40	75
>7 days	175	40	45	30	65
<b>Rehabilitation Complexity Scale (scaled to range 0 to 1.0)</b>					
0.0–0.4	120	30	30	30	40
0.4–0.6	180	45	45	30	75
0.6–1.0	197	60	30	30	90
<b>Barthel scale</b>					
0–4	225	45	30	30	60
5–9	180	45	50	30	85
10–14	120	40	45	30	70
15–19	70	30	45	40	60
20	60	30	50	45	80

**Table 6. Additional staff hours required to provide best care (per 24 hours per 10 beds).**

Discipline	Stroke units reporting (n)	Median	IQR
Nursing	53	11.3	7.3–17.8
Physiotherapy	58	5.6	3.3–9.7
Occupational therapy	60	5.1	2.6–9.1
Speech and language therapy	52	3.3	1.9–5.0

IQR = interquartile range.

that most patients have moderate levels of rehabilitation needs with only a few at either extreme.

Median nursing and therapy staffing levels in this survey are comparable to the descriptions in the existing literature, most closely resembling the combined results from the Stroke Unit Trialists’ Collaboration. However it is clear from the wide unexplained variation in contact time with the patient, and the reported additional time needed to achieve best care, that patients are receiving low levels of nursing and therapy time. Despite the assessment, monitoring and dependency demands of these patients, 75% get less than 4 hours 11 minutes of nursing input each 24 hours, with 25% getting less than one and a half hours equating to less than four minutes an hour on average. Almost a half of nurses providing this care are nursing assistants.

The data revealed that 75% of patients receive less than an hour of therapy, and 25% less than half an hour of any therapy each day. In addition, this level of therapy input is probably limited to daytime hours and weekdays as by far the most common pattern of care is for therapists to work on stroke units during normal weekday working hours. The lowest levels of therapy input are from speech and language therapists, with only one quarter of patients having any contact with a therapist, and median contact time being 30 minutes.

Total contact time for nurses with stroke patients appears to increase with the physical dependency level of their patients, as measured by the Barthel scale. Total therapist contact time appears to increase with the complexity of the rehabilitation needs of this patient group, as measured by the RCS. However, the wide variation in patient contact time is only partly explained by dependency.

While further research is needed to define optimal staffing levels and intensity and duration of rehabilitation after stroke, the estimates of additional hours of staff time required to provide best care in this survey provides insight into the perceived inadequacy of existing establishment levels. The median estimate of 11 additional hours per 10 beds per 24 hours for nursing care equates to 1.5 extra nurses on duty. Equivalent figures for the other disciplines are 1.3 for physiotherapy, 1 for occupational therapy and 0.75 for speech and language therapy.

It is possible to estimate the implications of this by multiplying the mean additional time required per 10 beds by the total number of stroke unit beds from the RCP organisational audit. The mean estimates should not be used to gauge the needs of individual units as they will be sensitive to extreme data. Mean times are 15.2 hours nursing, 7.2 hours physiotherapy, 6.7 hours occupational therapy, and 4.0 hours speech and language therapy. These translate to 979 WTE nurses, 465 WTE physiotherapists, 435 WTE occupational therapists, and 259 WTE speech and language therapists. However, it should be made clear that these estimates are based on the opinion of the staff working on stroke units and are not necessarily based upon any detailed calculation of need. They are presented only to provide a rough estimate of the level of resources that might be required to achieve high levels of care.

The weaknesses of the study are that the response rate was only 66% and that the survey was performed at only one point in time. We have also been unable to establish any correlation between staffing levels and quality of care as judged by each site’s performance on the National Sentinel Audit. This may be an issue related to the relatively small number of units surveyed or

that staffing level is only one part of the determinants of good quality care. Further work is needed to identify the number and level of seniority of staff working on a stroke unit to produce the ideal clinical outcomes.

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