The Prevalence of Joint Contractures, Pressure Sores, Painful Shoulder, Other Pain, Falls, and Depression in the Year After a Severely Disabling Stroke

Catherine Sackley, PhD; Nicola Brittle, BSc; Smitaa Patel, MSc; Julie Ellins, MSc; Martin Scott, MSc; Cristine Wright, BSc; Michael E. Dewey, PhD

Background and Purpose—Complications after stroke have been shown to impede rehabilitation, lead to poor functional outcome, and increase cost of care. This inception cohort study sought to investigate the prevalence of immobility-related complications during the first year after severely disabling stroke in relation to functional independence and place of residence.

Methods—Over a 7-month period, 600 stroke survivors were identified in the hospital through the Nottingham Stroke Register. Those who had a Barthel Index score \( \geq 10 \) 3 months poststroke and did not have a primary diagnosis of dementia were eligible to participate in the study. Assessments of complications were carried out at 3, 6, and 12 months poststroke.

Results—Complications were recorded for 122 stroke survivors (mean age, 76 years; 57% male). Sixty-three (52%) had significant language impairment and of the remaining 59 who were able to complete an assessment of cognitive function, 10 (8%) were cognitively impaired. The numbers of reported complications over 12 months, in rank order, were falls, 89 (73%); contracture, 73 (60%); pain, 67 (55%); shoulder pain, 64 (52%); depression, 61 (50%); and pressure sores, 26 (22%). A negative correlation was found between Barthel Index score and the number of complications experienced (low scores on the Barthel Index correlate with a high number of complications). The highest relative percentages of complications were experienced by patients who were living in a nursing home at the time of their last completed assessment.

Conclusions—Immobility-related complications are very common in the first year after a severely disabling stroke. Patients who are more functionally dependent in self-care are likely to experience a greater number of complications than those who are less dependent. Trials of techniques to limit and prevent complication are required. (Stroke. 2008; 39:3329-3334.)

Key Words: cerebrovascular accident complications prevalence

Subsequent to the diverse cognitive, functional, and sensory deficits associated with stroke, patients are at high risk of experiencing complications.\(^1\) Such complications have been shown to impede rehabilitation\(^2\) and are associated with poor functional outcome.\(^3\) There is evidence to demonstrate that poststroke complications and severe functional dependence significantly increase the length of hospital stay and direct cost of patient care.\(^3\)

Different complications have been studied to varying degrees in stroke survivors. Studies have shown the frequency of pressure sores after stroke to range from 0.7% in a rehabilitation setting in Singapore (\(n=140\))\(^4\) to 18% in an acute hospital setting in Scotland (\(n=607\)).\(^5\) A study on complications poststroke based in Scotland (\(n=311\)) similarly found that the frequency of pressure sores was at its highest during acute hospital stay (21%).\(^6\) The same study found that the occurrence of falls, pain, and depression increased after discharge.\(^6\) Poststroke depression has been examined further in an American review, which identified prevalence rates ranging from 23% to 44% in the community, 23% to 47% in acute hospital settings, 35% to 72% in rehabilitation hospital settings, and 22% to 42% in outpatient settings.\(^7\) A more recent meta-analysis on poststroke depression revealed pooled frequencies of 33% across all stroke survivors.\(^8\) However, despite previous speculation, the review concluded that time from stroke onset did not influence the occurrence of depression.

In a study on falls after stroke, Pérenou et al\(^9\) summarized some of the previous literature and found frequencies ranging from 10.5% to 73%. This large variation in results is common.
across much of the literature on poststroke complications and can be explained by inconsistencies in study design, patient demographics, definition of the complication, stroke characteristics, and duration of follow-up.

The majority of studies that have been published to date do not specify the level of disability of participants. The aim of this study was to report the prevalence of complications experienced by patients with severe disability at 3 months poststroke in relation to their functional dependence and ultimate place of residence.

**Methodology**

**Recruitment**

Potential participants were identified through the Nottingham Stroke Register, which records all stroke admissions to Nottingham City Hospital and Queens Medical Centre, Nottingham, UK. Individuals were subsequently contacted in person if they were in the hospital or by mail if they had been discharged. Information about the study was given together with an invitation to participate.

Individuals who consented to take part in the study were screened at 3 months poststroke using the Barthel Index (BI). In cases in which individuals were unable to self-report, the assessment was completed on behalf of the individual by their principle caregiver (demonstrated as a reliable method of administration). Participants with a BI score >10 and/or a primary diagnosis of dementia were excluded from the study.

**Procedure**

Baseline data on age, gender, and stroke characteristics were collected from medical notes at 3 months poststroke. Participants were also screened for cognitive and language impairment.

Assessments of prespecified complications were completed at 3, 6, and 12 months poststroke, at the participant’s place of residence, by one of 3 physiotherapists (J.E., M.S., C.S.). Six different types of complications were analyzed: joint contractures, pressure sores, painful shoulder, other pain, falls, and depression Each type of complication was recorded for its first occurrence only during the 12-month period, yielding a score out of a possible total of 6.

During the study, participants received rehabilitation consistent with National Health Service (NHS) standard practice. Ethical approval was gained from the Nottingham City Hospital ethics committee (EC96/97).

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**Figure 1. Flowchart of events.**
Measures

Screening Measures

Barthel Activity of Daily Living Index

The BI\textsuperscript{10} was used as a measure of functional ability. The 10-item questionnaire is scored from 0 to 20 with 20 denoting a higher level of independence.

Abbreviated Mental Test Score

For those who had acceptable levels of language (as measured by the Sheffield Screening Test for Acquired Language Disorders), cognitive impairment was assessed using the interviewer administered Abbreviated Mental Test Score.\textsuperscript{11} Subjects with an Abbreviated Mental Test Score of \( \geq 7 \) out of 10 were considered cognitively impaired.

Sheffield Screening Test for Acquired Language Disorders

The Sheffield Screening Test for Acquired Language Disorders was used to screen for language difficulties after stroke. The measure is scored from 0 to 20 with 20 signifying no impairment. Participants with a Sheffield Screening Test for Acquired Language Disorders score of \( < 15 \) were considered to have a language disorder. This cutoff point has been regarded as optimal for the detection of language impairment after stroke with a sensitivity of 89% and specificity of 88%.\textsuperscript{12}

Definition of Prespecified Complications

Falls

Any fall regardless of cause (including being dropped) that could be identified by staff/patient/caregiver or documented in accident book/hospital notes was defined as a fall.

Pressure Sores

Areas of localized damage to the skin and underlying tissue caused by pressure, shear, or friction were considered pressure sores. Identification was based on physical examination. Given the difficulty of recognizing superficial erythema of intact skin,\textsuperscript{13} we have followed the usual convention of judging Stage 1 ulcers as not present.\textsuperscript{13,14} Skin trauma due to falls was not included in the definition of pressure sores.

Shoulder Pain

Shoulder pain was considered present if documented in notes/care plans, reported by staff/caregiver, or if patient localized discomfort to any aspect of the affected shoulder when assessed by the physiotherapist, either at rest or with active or passive movement.

Other Pain

Other pain was as reported by patient/staff/caregiver or documented in medical notes/care plans or identified on drug charts.

Contracture

Contracture was estimated as 30% or higher restriction when compared with the good side\textsuperscript{15} on physical examination by a physiotherapist.

Depression

The Hospital Anxiety and Depression Scale\textsuperscript{16} was used to assess participants for signs of depression. Scores \( > 7 \) on the depression subscale of the Hospital Anxiety and Depression Scale were considered indicative of depressed mood.

The Stroke Aphasic Depression Questionnaire\textsuperscript{17} was used as a proxy for identifying depressed mood in patients who were unable to complete Hospital Anxiety and Depression Scale. The Stroke Aphasic Depression Questionnaire is a 10-item questionnaire completed on behalf of the patients by their principal caregiver. A score \( \geq 14 \) out of a possible 30 was considered a positive sign of depression. The Stroke Aphasic Depression Questionnaire has been validated against Hospital Anxiety and Depression Scale in community patients with stroke\textsuperscript{17} and in a care home setting.\textsuperscript{12}

Each complication was considered as a single dichotomous (present/absent) variable.

Table 1. Baseline Demographics (n=122)

| Age, years | Range | 31–98 |
| Gender | Female | 53 (43%) |
| Married | 45 (38%) |
| Divorced | 9 (7%) |
| Single | 9 (7%) |
| Residence before admission | Own home | 94 (77%) |
| (Prestroke/after discharge from the hospital) | Nursing home | 6 (5%) |
| Relative’s home | 4 (3%) |
| Residential home | 10 (8%) |
| Homeless | 1 (1%) |
| Sheltered accommodation | 6 (6%) |
| Length of stay, days | Range | 4–298 |
| Mean (SD) | 88 (62) |

NA indicates DC.

Table 2. Number of Patients With Each Complication at Each Time Point

<table>
<thead>
<tr>
<th></th>
<th>Pressure Sore n (%)</th>
<th>Shoulder Pain n (%)</th>
<th>Contracture n (%)</th>
<th>Falls n (%)</th>
<th>Pain n (%)</th>
<th>Depression n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 months (N=122)</td>
<td>21 (17)</td>
<td>44 (36)</td>
<td>53 (43)</td>
<td>56 (46)</td>
<td>47 (39)</td>
<td>43 (35)</td>
</tr>
<tr>
<td>6 months (N=89)</td>
<td>12 (13)</td>
<td>37 (42)</td>
<td>50 (56)</td>
<td>53 (60)</td>
<td>39 (44)</td>
<td>36 (40)</td>
</tr>
<tr>
<td>12 months (N=73)</td>
<td>13 (18)</td>
<td>34 (47)</td>
<td>49 (67)</td>
<td>42 (58)</td>
<td>38 (52)</td>
<td>31 (42)</td>
</tr>
</tbody>
</table>
Statistical Analysis
SAS, version 9.1, was used to create plots and tables for exploratory analysis and to obtain descriptive statistics.

Results
Six hundred patients with stroke were identified for the study from Nottingham City Hospital and the Queens Medical Centre, Nottingham, UK, over a 7-month period. Of the 413 patients screened, 146 patients satisfied inclusion and exclusion criteria and 122 formed the study sample of which 120 (98%), 83 (68%), and 71 (58%) completed the assessments at 3, 6, and 12 months poststroke, respectively (Figure 1).

Patient Cohort
The baseline demographics of the study sample are shown in Table 1. Participants had a mean age of 76 years (range, 31 to 98 years) and (57%) were male. Eighty-nine (73%) participants reported their first ever stroke, 27 (22%) had one previous stroke, and 6 (5%) more than one. Of the 93 (76%) living in their own homes before their stroke, only 48 (39%) returned by 1 year. Sixty-three (52%) scored <15 on the

Figure 2. Histogram showing the percentage of participants experiencing each complication in the first 12 months poststroke as a fraction of the number of participants in each place of residence at their final assessment (n=122).
Sheffield Screening Test for Acquired Language Disorders indicative of significant language impairment. Of the remaining 59 who were able to complete the Abbreviated Mental Test Score, 10 (8%) scored <11 indicating significant cognitive impairment.

Complications
The proportion of the sample with each complication at each time point is shown in Table 2. Over the whole observational period, the most prevalent types of complication experienced were falls, which were experienced by 89 (73%) participants, and contractures by 73 (60%). Pain was endured by 67 (55%) participants, shoulder pain 64 (52%), and emotional distress by 61 (50%). Pressure sores were experienced by 26 (22%) participants and were the least prevalent type of complication.

Complications by Residence Type
Figure 2 shows the percentage of participants experiencing each type of complication in the first year poststroke as a fraction of the number of participants in each place of residence at their last completed assessment. It does not dictate where complications occurred. Falls, contractures, pain, and depression were more common in nursing home residents. Shoulder pain and pressure sores were more common in sheltered accommodation and own homes, respectively.

Complications by Barthel Score
Figure 3 shows a negative correlation between the BI score at 3 months poststroke and the number of complications (out of 6) experienced in the first year poststroke. The Spearman correlation coefficient is $-0.338$ ($P=0.0004$). Each participant had at least one complication.

Discussion
As far as we are aware, this is the first prospective study examining complications in a cohort of functionally impaired patients with stroke. Unlike most, our sample did not exclude patients with language or cognitive impairment. In fact, these patients made up 60% of the study sample and would previously have been excluded by their inability to complete self-report measures of mood and shoulder pain. This could have a dramatic effect on estimates of prevalence of complications. There is evidence to suggest that aphasic patients are unable to report pain and therefore receive less pro re nata pain medication; therefore, the prevalence of pain reported in this sample may be higher than previously documented. Communication difficulties may have also led to delayed identification and hence prevention of complications. We overcame communication barriers by using by-proxy assessment methods and observed behaviors when necessary to assess patients.

The prevalence of complications observed in this study is toward the high end of the scale when compared with earlier findings. However, the number of people experiencing a complication at any point over the whole time period of the study compared with the number at a specific assessment varies with the nature of the complication. Depression, falls, and pain fluctuate, but pressure sores and contractures appear to be present for long phases.

Although language difficulties and cognitive impairment may increase chances of developing complications, the high dependency of our study sample (BI ≤10) is also likely to be a contributing factor. The latter assumption is reinforced by the negative correlation observed between BI score and number of complications experienced, which suggests that functionally impaired subjects are at greater risk of developing these complications. Similar findings were documented by Langhorne et al.

Many of the complications experienced were more prevalent among nursing home residents compared with residents living elsewhere. This is not surprising given that individuals living in such facilities are likely to be more impaired and have higher care needs than people living in their own homes, relatives’ homes, or residential homes. A smaller proportion
of participants in the hospital experienced complications compared with those in nursing homes. However, it should be noted that the place of residence reported in Figure 2 is the place that the last assessment was conducted; hence, the table may be slightly distorted by survival prejudice; many of the patients who died during the study may have constituted the "hospital group" in which case the duration of follow-up would have been less.

Limitations and Future Directions
Our sample was recruited by hospital admissions only. We do not consider this to be a significant limitation of the study because most individuals who were not admitted to the hospital would be unlikely to meet the inclusion criteria (BI \( \leq 10 \)). In our study, there was a high loss to follow-up due to the large number of deaths and we would expect a high survival prejudice at assessments 2 and 3. For example, patients with stroke developing a pressure sore in the first few weeks after admission have a 3-fold increase in 6-week mortality.19

With only 3 time points of assessment, the prevalence of complications may have been underreported. For example, depression may be identified and treated within a 6-month period and so may not be accounted for between the 6- and 12-month assessments. Falls are notoriously difficult to record accurately and completely in cognitively impaired populations.

However, the prevalence of so many complications must inevitably result in misery for the stroke survivor and a further burden to the caregiver and higher costs to society. It is not surprising that survivors with low BI scores experienced more complications. This is an important clinical finding given the uncertainty of any interventions in this group.20 Many of these complications are thought to be avoidable or treatable with rehabilitation and good-quality nursing care.21 It may be worth selecting people with very poor functional scores at 3 months poststroke and implementing a rehabilitation and nursing program targeted at low-level functional gains aimed toward maintenance rather than over-optimistic recovery goals. Little evidence exists to support interventions in severely disabled stroke survivors and the content of treatment and balance between active rehabilitation and more passive management is uncertain in this group. Identifying the needs of severely disabled survivors is the first step in designing interventions that can be tested. The need for randomized trials to identify the most successful interventions and, importantly, the timing of those interventions is urgently required.

Summary
Immobility-related complications are very common in the first year after a severely disabling stroke. Patients who are more functionally dependent at 3 months poststroke are likely to experience a greater number of complications than those who are less dependent. People with complications are also more likely to be living in nursing home facilities.

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Disclosures
None.

References
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