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Evaluation of an early discharge scheme for elderly people: outcomes at 3 months

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Introduction: The benefits to patients of schemes promoting early discharge from hospital are uncertain.

Method: We conducted a randomized controlled trial of an early discharge scheme in Nottingham. Patients allocated to the scheme were managed by a community rehabilitation service and the control group had usual hospital care. Outcomes were collected postally at three months using the

Table 1

	Range worst–best	Mean difference	95% CI	Difference: % of scale range									
				Intervention worse	Intervention better								
				-4	-2	0	2	4	6	8	10	12	14
Barthel	0–20	1.16	0.41 to 1.91										
Nottingham EADL	0–66	3.07	-0.13 to 6.27										
Subscales													
Mobility	0–18	0.32	-0.79 to 1.44										
Kitchen	0–15	1.24	0.23 to 2.25										
Domestic	0–15	1.08	0.15 to 2.01										
Leisure	0–18	0.48	-0.34 to 1.31										
Euroqol	-0.59–1	0.07	-0.01 to 0.14										
GHQ (patient)	36–0	-2.38	-4.07 to -0.70										
GHQ (carer)	36–0	-1.96	-3.79 to -0.12										

Barthel ADL Index, the Nottingham Extended ADL Index, the Euroqol and the General Health Questionnaire-12 (patient and carer).

Results: Three hundred and seventy patients were randomized, 185 to each group. The mean age was 79 years, 246 (67%) were female. Groups were well matched on baseline measures. Median hospital stays were seven days shorter in the intervention group. Eighteen died and 149 responses were analysed in the intervention group compared with 22 and 149 in the control group (88% response rate). Analysis was by linear regression (Table 1).

Conclusion: This early discharge scheme improved functional outcome and mood as well as reducing the length of hospital stay.

Normal human quadriceps strength, relative to body mass (BM), and electromyographic (EMG) spectral fatigue characteristics demonstrates no between-gender differences

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Background: In normal subjects quadriceps maximum voluntary contractions (MVCs) correlate with body mass (BM), so females are generally weaker. Knee osteoarthritis (OA) is more common in females, and it is hypothesized that it is this gender-related quadriceps weakness that predisposes females to knee OA.¹ We thus investigated between-gender differences in quadriceps maximum force generating capacity, normalizing for BM, and in EMG fatigue characteristics of quadriceps muscle components.

Methods: One hundred healthy volunteers (43 males), entered this ethically approved study. Their mean age height and weight (ISD) were: 32.4 (7.9) years, 174 (7.5) cm and 77.3 (13.2) kg respectively for males, and: 28 (6.9) years, 165 (6.5) cm and 65.7 (9.8) kg respectively for females. Quadriceps MVC was measured isometrically in a quadriceps chair, and lean BM (LBM) estimated from skinfold thickness.²

MVCs were expressed as relative ratios, i.e. force/unit BM (F/BM) and force/unit LBM (F/LBM). Surface EMG electrodes placed over vastus medialis and lateralis (VM & VL) and rectus femoris (RF) monitored fatigue-induced median frequency (MF) declines, during a 60-second isometric contraction at 60% of MVC in the dominant quadriceps. Statistical comparisons used independent *t*-tests.

Results: Overall, males were stronger, but the relative force ratios showed no between-gender differences; F/BM 5.08 (1.19) and 4.71 (1.05) N/kg for males and females respectively ($p = 0.101$) and F/LBM 6.38 (1.34) and 6.85 (1.58) N/kg respectively ($p = 0.12$). Linear MF declines were seen in all subjects, but there was no between-gender difference in the linear regression slopes correlating MVC and LBM ($r = 0.53$ and 0.49 respectively, $p > 0.05$). The group results showed no differences in the MF decline slopes of the quadriceps heads: -0.31 (0.15), -0.33 (0.17) and -0.37 (0.17) for VM, VL and RF respectively in males, and -0.34 (0.14), -0.37 (0.2) and -0.41 (0.23) respectively in females. There were no between-gender MF decline slope differences in any on the muscles tested ($p = 0.31, 0.29$ and 0.42 respectively).

Conclusion: Gender differences in predisposition to knee OA are unexplainable by gender differences in quadriceps force generating capacity, or in quadriceps EMG fatigue characteristics.

References

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Pilot study to investigate the neurobiological basis for rehabilitation after stroke using functional MRI

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Background: Motor rehabilitation therapy is commonly employed after strokes, but outcomes are variable and there is little specific information about the changes in brain activity that are associated with improved function. We performed serial functional magnetic resonance imaging (fMRI) on three patients receiving a form of rehabilitation therapy after stroke in order to characterize the nature of functional changes in the brain that correlate with behavioural improvements.

Methods:

Subjects: Three patients with mild to moderate hemiparesis (arm motricity scores 58–93) at least six months post stroke.

fMRI scanning: Fortnightly, twice before and twice after intervention. Individuals performed blocks of hand tapping alternated with rest blocks. Image analysis, including fixed effects analyses to compare post- to pre-therapy scans ($z > 2.3$, $p < 0.01$), was carried out using in-house extensions of MedX.

Functional testing: Including Motricity Index, Grip Strength, and Jebsen card turning, was performed weekly, four times pre and twice post intervention.

Movement therapy: This was based on Constraint-induced Therapy principles and involved two weeks of restraint for the unaffected arm for 90% of waking time and twice daily performance of a 30-minute exercise programme with the affected arm.

Results: One patient (3) showed substantial improvements in affected (left) arm function after therapy (Arm motricity: pre, 58 ± 0 ; post, 76

± 0 ; Grip: pre, 24 ± 3 , post, 31 ± 1 ; Card Turning (seconds): pre, 8.1 ± 0.8 , post, 6.7 ± 0.0). This patient also showed increased fMRI activation in supplementary motor area, left premotor cortex and right posterior parietal cortex after intervention. Patients 1 and 2 showed smaller and less consistent improvements in function and no significant change in fMRI activation.

Discussion: This study demonstrates the potential for fMRI to define regions of functional brain activation changes associated with functional gains after even a brief rehabilitation intervention.

The impact of botulinum toxin (BT-A) on associated reactions in the paretic arm in stroke

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Background: Abnormal arm movements occur with effort (associated reactions) after stroke. They may interfere with activities of daily living (ADL) and are targets for physiotherapy. Botulinum toxin (BT-A) may reduce these abnormal movements by selective muscle relaxation.

Method:

Study design: A randomized double-blind placebo controlled trial with two baseline (week -1 and 0) and three postintervention measurements (weeks 2, 6, 12).

Subjects and intervention: Forty consecutive stroke patients (median time since stroke 2.7 years) referred for BT-A to an outpatient clinic, with arm spasticity, who consented to participate, were randomized to receive placebo ($n = 20$) or BT-A ($n = 20$, 1000MU (Dysport) divided between elbow, wrist and finger flexors). Concurrent treatments as far as possible remained unchanged.

Outcomes: Associated reactions (AR) in the arm were measured using hand dynamometry. Effort

used was maximum voluntary grip. Activities that patients felt caused the AR and those that were affected by AR were recorded.

Analysis: Primary analysis was undertaken at week 6 using the chi-squared statistic and Student's *t*-test.

Results: Peak AR force was reduced at week 6 with BT-A (mean change -20 N; SD 20.9) compared with placebo (mean change $+0.1$ N; SD 11.9; mean group difference 19.0, 95% CI 7.2, 30.9; $p < 0.01$) and week 2 ($p = 0.005$) but effect wearing off by week 12 ($p = 0.09$). Comparable amounts of effort were used. Thirty-one patients reported abnormal arm movement with effort, automatic activities and emotional upset. Twenty-four of 31 reported this movement interfering with daily activities. Nine of 12 patients receiving BT-A and 3/12 receiving placebo reported reduction ion interference with daily activities ($p = 0.04$).

Conclusion: BT-A reduces AR and their impact on daily activities. BT-A may also be a useful adjunct to physical therapy.

Movement strategies used during fall-related activities by repeat fallers and nonrepeat fallers with Parkinson's disease (PD)

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Background: Information about the movement strategies deployed by repeat fallers (RFs) during fall-related activities is limited. The aims of this study were to describe how people with Parkinson's disease (PD) naturally turn and reach, and compare the movement strategies of RFs with those of nonrepeat fallers (NRFs).

Method: Independently mobile people with PD living in the community were recruited through GPs. Their disease severity, self-assessed disability and fall history was assessed at home. How subjects turned, reached high and reached low whilst making a cup of tea was video-recorded and rated blind using a validated, reliable checklist.

Results: Seventy-five subjects (48 men), median age 73 years and median Hoehn and Yahr grade III were recruited. Forty-three subjects were RFs: they had greater disease severity and self-assessed disability than NRFs. Falls reported had occurred most frequently when walking (41%) or turning (17%). When turning, forwards-stepping (33%) or sideways-stepping (32%) movements were common, a median of six steps was taken, 88% demonstrated reduced heelstrike and 25% used support. When reaching, 75% of subjects used support, 82% aligned forwards and 69% stood with their feet parallel. RFs and NRFs moved in similar ways, but RFs had a significantly smaller base width between their feet prior to moving ($p < 0.001$). Increased disease severity was linked with a high number of turning steps and observed instability.

Conclusion: Surprisingly, the RFs were *not* distinguishable from NRFs by the way they moved during common fall-related activities. Rather, the small base area and apparent instability during functional activity should be targeted for intervention.

The relationship between spasticity and function post stroke

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Introduction: Spasticity is a recognized complication of stroke and is thought to contribute to impaired function. Despite much resource being targeted towards preventing spasticity, in an attempt to improve function, few empirical data exist thus far. This study aimed to systematically examine the relationship between spasticity and functional ability.

Design: A cohort study.

Setting: Initially hospitalized but subsequently community-dwelling stroke survivors in Liverpool.

Subjects: Consecutively presenting stroke patients surviving to 12 months.

Methods: Muscle tone was measured in the arms and legs using the modified Ashworth scale and the Tone Assessment Scale¹ and functional ability using the modified Barthel Index (BI). Spasticity and functional ability were compared using Mann–Whitney *U*-tests.

Results: Two hundred and seventy patients were registered, of whom 136 survived to 12 months. One hundred and six consented (median age 71, interquartile range (IQR) 64–78; 36 had a previous stroke; 52 were female). Forty (38%) patients had spasticity. Those with spasticity had significantly lower Barthel scores at 12 months ($p < 0.0001$). In those with no spasticity, median BI = 19 (IQR 16–20). In those with spasticity only in the arm, median BI = 19 (IQR 6–20). In those with spasticity only in the leg, median BI = 16 (IQR 6–17). In those with spasticity in both arm and leg, median BI = 10 (IQR 5–15).

Conclusion: When comparing spasticity and function, it is apparent that those with spasticity are more dependent. It would appear that spasticity in the leg is more disabling, although this may be a result of the items in the BI.

Reference

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The cost of stroke and rehabilitation in Liverpool

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Introduction: Stroke is the highest cause of morbidity and consumes much financial resource. Patterns of resource use after stroke are needed to target interventions aimed at reducing costs.

This study estimates direct costs of stroke from a Health Authority perspective.

Setting: A university teaching hospital in Liverpool.

Subjects: All acute stroke admissions registered in a six-month period.

Methods: For patients registered, data were gathered prospectively on admission, discharge and three, six and 12 months post stroke. Cost data were obtained from relevant finance departments.

Results: Two hundred and seventy patients were registered (median age 75 years, interquartile range 67–81, 142 (53%) females. One hundred and seventy (63%) patients were discharged alive, and by 12 months, there were 136 (51%) survivors, of whom 31 (11%) were in institutional care.

In terms of costs, inpatient care was divided up into ward costs (£703 944), based on bed-days, investigations (£47 957) and rehabilitation (£154 676).

Outpatient care was based on continuing care costs (£379 704), community rehabilitation (£74 751), community services (£93 563) and GP contacts (£9045). A further source of costs was readmissions (£175 482) and Accident and Emergency attendance (£19 892).

The total cost of stroke for this cohort was estimated to be £1 665 725 which equated to a cost per patient per year of £6169.

Rehabilitation forms only 17% of inpatient and 10% of postdischarge costs.

Conclusion: Rehabilitation costs are proportionately low. Doubling the amount of rehabilitation input would add proportionately little to the overall cost. However, even small improvements in functional outcome have the potential to significantly reduce the overall cost by reducing the inpatient bed-days and outpatient institutionalization.

Functional decline and further falls: the role of psychological factors

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Background and purpose: Functional decline is more strongly related to fear of falling than to falling itself. This study aimed to identify factors contributing to fear of falling.

Design: Cross-sectional cohort study.

Subjects: Subjects were randomly selected from those previously recruited to a community-based falls intervention study.

Methods: Subjects were interviewed in their own homes regarding basic demographic details, falls, fear of falling, social support, personality characteristics, function, handicap and mood.

Results: Of 100 subjects approached, 71 were included (20 unable or unwilling to consent, 3 dead, 4 nursing home, 2 unable to contact). Median age 76 (interquartile range 72–81), 52 (73%) were female. A further five were excluded due to cognitive impairment.

There was no significant relationship between fear of falling (Modified Falls Efficacy Scale (MFES)) and; age, sex, falling, social support, locus of control or coping strategies. MFES was significantly related to current function (Barthel Index, Spearman's $\rho = 0.55$, $p < 0.001$; Life Space Diameter, $\rho = 0.61$, $p < 0.001$), handicap (Falls Handicap Inventory (FHI)), $\rho = -0.74$, $p < 0.001$; Oxford Handicap Scale (OHS) $\rho = -0.73$, $p < 0.001$) and mood (Montgomery Asberg Depression Rating Scale, $\rho = 0.51$, $p < 0.001$; General Health Questionnaire-28 (GHQ-28), $\rho = -0.36$, $p < 0.005$).

In order to clarify the relative contribution of each of the significantly related variables (to fear of falling), multiple regression analysis was performed. $MFES = (-1.03 \times FHI) + (-13.94 \times OHS) + (1.32 \times GHQ-28) + 137.36$. OHS and FHI accounted for 86% of the variance.

Conclusions: There is a significant relationship between fear of falling, handicap and mood.

Applying this model in different cohorts is necessary to test its usefulness.

Communication practices through which therapists indicate and repair patients' errors whilst maintaining motivation

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Research question: This qualitative study examines practices through which patients and therapists communicate. One of the research questions asks: How do therapists point out patients' errors of performance during treatment activities without demotivating them?

Data and analysis: Data consist of 77 video-recorded treatment sessions involving 10 experienced physiotherapists and 21 stroke patients in four English hospitals. The analytical approach derives from conversation analysis. Sequences that involved apparent problems of performance were edited together and scrutinized repeatedly. Participants' verbal and bodily conduct were transcribed. Analysis sought recurrent patterns in how problems were managed, and also less usual events such as overt misunderstanding or disagreement about problems. Group data analysis sessions augmented this process.

Findings: Very occasionally, therapists directly indicate and repair problems. More commonly they use a range of less direct practices.

These include:

- Instigating reparative actions without actually naming the problem
- Naming the problem in minimized or mitigated form
- 'Perspective display sequences' in which the patient's perspective is elicited before the therapist's view is stated.

Also, problem indications are often closely associated with encouraging talk about progress in other areas.

Discussion: Therapists are exhorted to communicate openly and unambiguously.¹ But sometimes, as when indicating performance shortfalls, prac-

tioners communicate indirectly. In doing so, they attend to a general social preference for not criticizing others, and avoid undermining patients' participation. This research reveals some skilful practices whereby therapists can make patients' problems apparent with subtlety, and can convey these problems as justifying continued efforts and participation.

Reference

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An investigation into the reliability of rehabilitation measures in adults with learning disabilities

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Objective: To estimate the reliability of three rehabilitation measures, to determine their suitability for clinical and research use in a population of adults with learning disabilities.

Design: Test–retest and inter-rater reliability study.

Setting: Subjects' own homes.

Subjects: One hundred and seventeen subjects were identified as a random sample from a population of 181 adults known to Nottingham Community Physiotherapy Service for Adults with Learning Disabilities. Thirty-four were excluded due to the prespecified criteria and 36 others were unable to participate for other reasons, leaving 47 who entered the study.

Measures: The Berg Balance Scale, Rivermead Mobility Index and Barthel Activity of Daily Living Index.

Methods: Subjects were visited by two researchers on two occasions, one week apart and rated independently by each rater. Agreement was assessed with the kappa statistic and percentage agreement for each individual item in each scale and described using standard classification.

Results: The Barthel Index and Rivermead Mobility Index had almost perfect agreement ($\kappa = 0.86$ – 1.00), and ($\kappa = 0.89$ – 1.00) respectively, with the Berg Balance Scale having substantial to almost perfect agreement ($\kappa = 0.74$ – 1.00), for inter-rater observations. For test–retest comparisons, the Barthel Index varied from moderate to almost perfect agreement ($\kappa = 0.57$ – 1.00). The Rivermead Mobility Index showed moderate to almost perfect agreement ($\kappa = 0.45$ – 1.00). Kappa scores for the Berg Balance Scale varied from substantial to almost perfect agreement ($\kappa = 0.63$ – 1.00), except in three items ($\kappa = 0.37$ – 0.58).

Conclusions: The Berg Balance Scale, Rivermead Mobility Index and Barthel Index are all reliable clinical and research tools for the assessment of adults with learning disabilities.

The experience of spouses caring for a partner admitted to hospital following a single stroke

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Background: Carer stress following stroke is well recognized. This research explores spouses' perceived life changes and perceived role within the hospital environment following their partner's stroke.

Method: Life narrative interviews were carried out with 13 participants (3 male) aged 30–85

(median 66) years, whose partners were concurrently in hospital following a single stroke. Interviews took place in the participant's home. Participants were guided to speak about their past, present and future life. Interviews were audiotaped and fully transcribed. Fieldnotes were made. Transcripts were re-read to identify how the participant positioned themselves within their stories in relation to staff within the hospital environment. Similarities and differences were compared across participants. Transcripts were read independently by two researchers to confirm or challenge interpretations.

Findings: Spouses described a fundamental life change and a need to constantly plan and think about their future. Although the hospital was their main source of information, they described gaining information mainly on an *ad hoc* basis, e.g. through sitting with their partner, or attending physiotherapy sessions. Unless they had good relationships with ward staff, they did not feel able to ask for information. Recognition and acknowledgement of their outside life was important. Even good relationships with staff were fragile; trust could be damaged through conflicting information or delays.

Conclusion: Spouses are constantly planning the couples' future lives, and they need accurate timely information. Gaining information appears to be only possible if spouses feel able to approach ward staff through structured formal, but especially informal relationships.

People with a stroke living in the community: An investigation into the relationship between attention, functional ability and falls

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Background: Information about the attention deficits of people with stroke living in the community is limited. The aims of this study were, to describe levels of attention and to explore the relationships between attention deficits, functional ability and fall events.

Method: Subjects living in the community were

identified through GPs and therapy records. Assessments of balance, ADL function, attention and history of falls were completed in participants' homes for this cross-sectional study.

Results: Forty-eight participants (30 men, 18 women; mean age 68.4, SD 11.2) were recruited, 17 were repeat fallers, 7 single fallers, 12 were nonfallers with near falls and 12 were nonfallers with no near falls. One subject had a brainstem lesion, 26 had right and 21 left hemisphere infarctions. Mean time since onset of stroke was 46 months (range 5–204). Five (10.4%) participants presented with visual inattention, 15 (31%) had sustained attention deficits, 9 (19%) had auditory selective attention deficits, 17 (35%) had visual selective attention deficits and 21 (43%) presented with divided attention deficits. Sustained and divided attention scores were found to correlate with the scores for balance and ADL ability ($p < 0.01$). The balance and functional abilities of those subjects with normal attention scores were significantly better than those with abnormal scores ($p < 0.01$). Analysis of variance revealed significant differences between the fall groups for balance, ADL ability and divided attention; the greatest differences ($p < 0.01$) were between repeat fallers and nonfallers with no near falls.

Conclusions: Attention deficits were common among community-dwelling people with stroke. Repeat fallers had significantly more problems dividing attention than nonfallers with no near falls. Those with impaired attention and those who had fallen repeatedly had significantly greater functional deficits.

Movement strategies used during fall-related activities by repeat fallers and nonrepeat fallers with Parkinson's disease (PD)

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Background: Information about the movement strategies deployed by repeat fallers (RFs) during fall-related activities is limited. The aims of this study were to describe how people with

PD naturally turn and reach and compare the movement strategies of RFs with those of non-repeat fallers (NRFs).

Method: Independently mobile people with PD living in the community were recruited through GPs. Their disease severity, self-assessed disability and fall history was assessed at home. How subjects turned, reached high and reached low whilst making a cup of tea was video-recorded and rated blind using a validated, reliable checklist.

Results: Seventy-five subjects (48 men), median age 73 years and median Hoehn and Yahr grade III were recruited. Forty-three subjects were RFs: they had greater disease severity and self-assessed disability than NRFs. Falls reported had occurred most frequently when walking (41%) or turning (17%). When turning, forwards stepping (33%) or sideways stepping (32%) movements were common, a median of six steps was taken, 88% demonstrated reduced heelstrike and 25% used support. When reaching, 75% of subjects used support, 82% aligned forwards and 69% stood with their feet parallel. RFs and NRFs moved in similar ways, but RFs had a significantly smaller base width between their feet prior to moving ($p < 0.001$). Increased disease severity was linked with a high number of turning steps and observed instability.

Conclusion: Surprisingly, the RFs were *not* distinguishable from NRFs by the way they moved during common fall-related activities. Rather, the small base area and apparent instability during functional activity should be targeted for intervention.

Development of the Brunel Balance Assessment

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Background: The Brunel Balance Assessment is a new test of balance disability for people with stroke, which covers a wide range of abilities and is suitable for use in the research or clinical setting. It combines an ordinal scale of balance disability drawn from the clinical assessment model with performance tests of balance impairments. The Guttman scaling of the ordinal scale is reported here.

Method:

Subjects: Eighty people with a post-stroke hemiplegia and no other pathology effecting their balance and mobility who were attending physiotherapy.

Analysis: The hierarchical order was tested using pass rates for each item and coefficients of reproducibility (CR) and scalability (CS). Internal consistency was assessed using Cronbach's alpha coefficient, and redundancy of items was assessed using an inter-item correlation.

Results: The hierarchy of items suggested from the pass rates produced a CR of 0.994, and a CS of 0.69. Cronbach's alpha was 0.93, indicating acceptable internal consistency as a measure of balance. The inter-item correlation indicated two items (one sitting and one standing test) were redundant; these were removed. This did not adversely effect the results, for the revised scale the CR and CS were unaltered, and the alpha coefficient was 0.92.

Conclusion: The Brunel Balance Assessment forms a Guttman-type hierarchical scale. Further study will assess the other psychometric properties.