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Synapse

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INSIDE

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Welcome

Dear members,

Welcome to the spring 2023 edition of *Synapse*.

Special features of this edition include abstracts from the long-awaited face-to-face ACPIN international conference held at the Royal College of Physicians in London on the 11th and 12th of July 2022 and from the online conference held on 9th October 2021.

The aim of *Synapse* – the official journal of ACPIN – is to provide its readership (nationally and internationally), including wider multidisciplinary teams, an international, peer-reviewed platform for the publication, dissemination, knowledge exchange and discussion of recent developments and current research in the field of neurological rehabilitation.

The journal accepts original, quantitative and qualitative research reports, theoretical papers, systematic literature reviews, scoping reviews, service evaluations, quality improvement programmes, clinical case reports and technical clinical notes.

If you are interested in submitting your work for publication in *Synapse*, please follow the guidelines for manuscript preparation presented on page 43 and send your work for inclusion in the peer-review process. I look forward to receiving high-quality work for publication.

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Contents

Increasing physiotherapy staffing is associated with reduced length of stay and improved functional outcomes:

a service evaluation project

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The All Party Parliamentary Group (APPG) on acquired brain injury have acknowledged that improvements in emergency care have led to increased survival but "neurorehabilitation provision for survivors is inadequate, limiting their reintegration into society" (APPG, 2018).

Specialist inpatient rehabilitation for adults with a range of complex neurological disabilities can be cost effective (Turner-Stokes *et al* 2016, APPG 2018), reduce length of stay and improve patient functional outcomes (McGlinchey and Buttery 2020, Turner-Stokes *et al* 2016, Saunders *et al* 2019, Slade *et al* 2002), but evidence in acute neuroscience wards is scarce.

Perhaps as a consequence of the heterogeneric clinical population that are admitted to acute neuroscience wards, there is an absence of guidelines regarding the amount of therapy that should be delivered or the therapist to patient ratio within the National Health Service (NHS). Within neurorehabilitation, stroke has the clearest recommendations in terms of dose of therapy, with national guidelines advising "at least 45 minutes of each appropriate therapy every day, as long as they are willing and capable of participating" (Intercollegiate Stroke Working Party 2016). A desire to improve patient outcomes and pressures on hospital bed occupancy in the NHS have focused our attention on our current staffing levels in the acute neuroscience wards, to see if additional staffing may contribute to enhanced patient outcomes whilst reducing hospital length of stay.

In December 2020 funding was gained for an additional band 6 physiotherapist for a 10-week pilot period. The aim of this service evaluation is to examine whether increasing the provision of physiotherapy was associated with improved patient flow and patient outcomes in acute neurosciences at Cambridge University Hospitals NHS Trust (CUH).

METHODS

Design

We conducted a pragmatic service evaluation using routinely collected data at three time periods. The first, during the 10-week pilot period of additional physiotherapy staffing from March to May 2021, and for comparison, data were extracted from September-December 2020 and September-December 2018. This service evaluation project was approved as a service evaluation by our centre's Safety and Quality Support Department (Project Register Number 9724); ethical approval was not required.

Setting

CUH is a Major Trauma Centre (MTC) with acute neuroscience wards covering 81 inpatient beds within Addenbrooke's Hospital. Neuroscience patients in the Trust can be under neurosurgery, neurology or neuro-oncology specialisms. Patients are often stepped down to the neuroscience wards after a period of time on the Neuro Critical Care Unit (NCCU). There is a Major Trauma Centre in each of the 26 regional Major Trauma Networks in England, designed with services to deliver good care, including consultant-led trauma teams 24/7, emergency surgery, immediate access to computed tomography (CT) and magnetic resonance imaging (MRI), along with dedicated major trauma beds (McCullough *et al* 2014). Best practice tariff requires that patients are assessed and have a written rehabilitation prescription within 72 hours of injury, but there is no specific guidance for MTC's in terms of the amount of rehabilitation that should be provided (McCullough *et al* 2014).

Eligibility criteria

We included two specific groups of patients. Eligibility for both groups included the requirement for the patient to be admitted to one of the neuroscience wards at CUH under the care of a neurosurgeon, neurologist or

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neuro-oncologist. The first group of patients (Group 1) were those that had a Modified Rivermead Index (MRMI) score between eight and 17 on initial physiotherapy assessment, the second group (Group 2) were those that had a tracheostomy tube in situ on initial physiotherapy assessment.

The pilot project aimed to make a demonstrable impact of additional staffing by aiming to provide patients with a minimum of 45 minutes of physiotherapy every weekday if deemed appropriate by the clinician and patient. In the absence of guidelines for this specific group of patients, this dose of physiotherapy was based on the RCP stroke guidelines (Intercollegiate Stroke Working Party 2016). Due to financial restrictions this was only possible with a subgroup of patients admitted to the neuroscience wards, and the decision was therefore made to select patients in Group 1 (MRMI score between 8-17) who we hypothesised were most likely to have their length of stay shortened by increased physiotherapy intensity. In the absence of hard evidence to support a defined subgroup of patients that would most likely benefit, the eligibility of an MRMI score of 8-17 was based on clinical judgement and review of previous service audits. Group 2 who had a criterion of a tracheostomy tube in situ (regardless of their MRMI score) was also based on clinical judgement and review of previous service audits showing an unmet need in this subgroup's rehabilitation needs.

Participants

Pilot cohort

Physiotherapy provision was increased to a rolling caseload of six to eight patients (exact number judged by project lead dependent on time required to meet their rehab needs). If patients required double staffing levels for moving and handling and optimising their therapy sessions, then physiotherapy staff were used to help from the usual neuroscience physiotherapy service. When a pilot patient was discharged from the neuroscience wards, the next available patient who met the eligibility criteria was added to minimise bias in selection. Physiotherapy treatment focused on repetitive task specific practice at a higher dose than what has historically been available in the service.

Historical cohorts for comparison

Two historical cohorts, one from 2018, one from 2020 were used for the purposes of outcome comparison with the pilot cohort. Due to resource limitations, the size of each cohort was 39 participants to match the pilot cohort size.

The 2018 cohort was selected from a previous retrospective audit of 473 patients from an 11-week period from September–December 2018. A convenience sample of 39 participants was selected by selecting all twelve participants with tracheostomy tubes in situ at ward admission, and every third patient with an admission MRMI score between 8-17 until n = 39.

The 2020 cohort was selected from all participants who received physiotherapy between September 2020 and December 2020. An anonymised list of patients was ordered by their hospital ID and systematically screened for eligibility by members of the physiotherapy team. The first 39 patients to meet the eligibility criteria of either Group 1 (MRMI score between 8 and 17) or Group 2 (tracheostomy tube in situ) were included.

Measures

Routinely collected data was retrospectively extracted from patient electronic records. All measures used in this service improvement programme were routinely collected as part of normal clinical care.

For descriptive purposes, admission diagnosis and number of physiotherapy sessions were collected. Minutes of physiotherapy could not be reliably collected in historical cohorts as the data was incomplete and included patient facing and non-patient facing time. The outcome variables collected were length of stay in the acute neuroscience wards (days), the MRMI (as scored by the treating physiotherapist on physiotherapy assessment and discharge from the neuroscience wards), whether the patients had a tracheostomy tube in situ on this admission, and their discharge destination (level of inpatient rehabilitation specialism, home with/without care support and with/without community physiotherapy, or a 24-hour care institution with/without community physiotherapy). Information on inpatient mortality, and medical deterioration requiring critical care was also collected.

The MRMI is a standardised assessment of mobility that involves direct observation of eight functional mobility tasks, each being given a score of 0-5 dependent on the level of independence (Radman *et al* 2015). A maximum score of 40 is possible with higher scores indicative of increased mobility.

Level of rehabilitation needs was assessed on admission to, and discharge from the neuroscience wards, using the Department of Health Specialist Services National Definition Set (SSNDS) (Department of Health 2009). This defines four categories of patient need (A, B, C, D) and three levels of rehabilitation service (1, 2 and 3) which are a framework used nationally for planning and commissioning of specialist rehabilitation services. The four categories of patient need for rehabilitation services help to define the complexity of needs for key factors such as needs for skilled nursing

> *… there is an absence of guidelines regarding the amount of therapy that should be delivered or the therapist to patient ratio within the National Health Service.*

DESCRIPTION OF COHORTS

	2018 n = 39	2020 n = 39	2021 – extra staff n = 39	p-value for difference between groups
Age	62.0 (52.5–68.0)	65.0 (53.0–77.5)	57.0 (49.5–72.5)	p = 0.474
Female	20	22	20	p = 0.919
MRMI on admission to neuroscience wards	10.0 (3.5–13.0)	11.0 (8.0–14.0)	9.0 (8.0–12.5)	p = 0.715
Tracheostomy in situ at admission to ward	12	10	9	p = 0.808
Hospital admission diagnoses				
I60-69 Cerebrovascular diseases	9 (23%)	10 (26%)	9 (23%)	p = 1.000
S00-S09 Injuries to the head	11 (28%)	9 (23%)	11 (28%)	p = 0.898
S10-S19 Injuries to the neck	4 (10%)	2 (5%)	2 (5%)	p = 0.728
C69-C72 Malignant neoplasm of eye, brain and other parts of central nervous system	4 (10%)	5 (13%)	1 (3%)	p = 0.338
S30-S39 Injuries to the abdomen, lower back, lumbar spine and pelvis	2 (5%)	6 (15%)	8 (21%)	p = 0.122
D10-D36 Benign neoplasms	2 (5%)	3 (8%)	5 (13%)	p = 0.600
Other	7 (18%)	4 (10%)	3 (8%)	p = 0.454

Table 1 Data presented as median (IQR) or count (percentage).
P-values calculated using ANOVA for continuous outcomes and Fisher Exact Test for binary outcomes.

care, the number of therapy disciplines involved and the need for specialist equipment. Level 1 centres provide highly specialised rehabilitation services at a regional / national level, moving gradually to level 3 local, non-specialist rehabilitation services (Department of Health 2009).

> *… results show that a higher provision of physiotherapy staffing was associated with significantly lower length of stay on the neuroscience wards.*

Statistical analysis

Anonymised data were analysed with R software (R Core Team 2020). Descriptive statistics were given as count (with percentage) or median (with interquartile range – IQR).

As most outcomes were not normally distributed, Wilcoxon rank sum tests with continuity corrections were used for unadjusted pairwise comparisons of continuous outcomes. For binary outcomes due to small numbers of events, the Fisher exact test with continuity correction was used to compare cohorts.

A one-way analysis of covariance (ANOVA) models was used to assess whether there were differences between the cohorts in length of stay and change in MRMI, with age, and admission MRMI scores controlled for. To meet the assumptions of normality and homogeneity of variance, a log transformation was used for the length of stay variable. Binary logistic regression was used to assess whether there were differences between the cohorts in the number of participants with reduced rehabilitation needs at discharge compared to admission and the number of patients with a tracheostomy who were decannulated. As with ANOVA analyses, age, and admission MRMI scores were controlled for in the binary logistic regression models.

RESULTS

Patients' characteristics are presented in *Table 1*. The 2021 cohort was on average younger than the 2020 and 2018 cohort but this difference was not statistically significant. The sample was comparable in terms of sex, functional abilities on admission to the neuroscience wards, and diagnosis based on ICD-10 coding system (https://icd.who.int/browse10/2016/en), summarised in *Table 1*. The most common reason for admission in all three samples was head injuries. The number of patients with tracheostomy tubes in situ was comparable across cohorts.

The average number of face-to-face physiotherapy sessions per week did vary, with the 2021 having a median of 4.3 (IQR: 3.9–7.0) sessions per week, significantly more (p <0.001) than the 2018 cohort who had a median of 3.0 sessions (2.0–4.7) and the 2020 cohort (p <0.001) who had a median of 2.3 sessions (2.0 - 3.2). In 2021 the median length of each rehabilitation session was 32.5min (27.1 – 36.5min).

The 2021 cohort had a significantly shorter length of stay than the 2018 cohort (p = 0.019) and 2020 cohort (p <0.001) (see *Table 2*). This significance was maintained when controlling for age and baseline MRMI scores. Length of stay was shorter by 36.7% (p = 0.015), and 46.4% (p = 0.014) in the 2021 cohort compared to the 2018 and 2020 cohorts respectively (see *Table 3*).

The 2021 cohort had significantly greater changes in the MRMI scores from admission to discharge than the 2018 cohort (p = 0.031) and 2020 cohort (p = 0.033). When controlling for age and admission MRMI scores, the 2021

HOSPITAL AND PATIENT OUTCOMES COMPARED BETWEEN THE THREE COHORTS

Variable	2018	2020	2021 – extra staff	Pairwise comparisons	
Length of stay (days)	14.0 (7.5–20.5) n = 39	17.0 (11.0–21.5)	8.0 (4.5–12.0)	2018 v 2020	$p = 0.357$
				2018 v 2021	$p = 0.019$
				2020 v 2021	$p < 0.001$
Change in MRMI score from admission to discharge	3.0 (0.0–19.5)	6.0 (0.5–16.5)	15.0 (4.5–21.0)	2018 v 2020	$p = 0.739$
				2018 v 2021	$p = 0.031$
				2020 v 2021	$p = 0.033$
Reduction in discharge rehabilitation needs admission to discharge	12 (31%)	14 (36%)	20 (51%)	2018 v 2020	$p = 0.811$
				2018 v 2021	$p = 0.319$
				2020 v 2021	$p = 0.507$
Number of patients with a tracheostomy who were decannulated	0 (0%) n = 12	3 (33%) n = 10	4 (44%) n = 9	2018 v 2020	$p = 0.156$
				2018 v 2021	$p = 0.063$
				2020 v 2021	$p = 0.650$

Table 2 Data presented as median (IQR) or count (percentage). Pairwise p-values for continuous outcomes calculated using Wilcoxon rank sum test with continuity correction, and Fisher's exact test with continuity correction for dichotomous outcomes.

cohort had a higher estimated change of 5.1 points compared to the 2018 ($p = 0.038$) cohort and 2020 cohort ($p = 0.036$) (see *Table 3*).

There was no significant difference between cohorts in terms of the number of patients with reduced rehabilitation needs by discharge from the neuro-science wards or the number of patients with tracheostomies who were decannulated. This was the same in the binomial logistic regression models (*Table 4*) that adjusted for age and admission MRMI scores.

DISCUSSION

Our results show that a higher provision of physiotherapy staffing was associated with significantly lower length of stay on the neuroscience wards, and greater changes in functional recovery as measured by the MRMI. Although greater proportions of patients had reduced rehabilitation needs by discharge from neuroscience wards, and more patients with tracheostomies were decannulated, neither of these differences in outcomes were statistically significant. We demonstrated that providing a higher frequency of physiotherapy sessions was feasible and was tolerated by patients.

Much of the existing body of evidence for dose of therapy in neurological rehabilitation comes from stroke (Cooke *et al* 2010, Lohse *et al* 2014, Schneider *et al* 2016, Avert Trial Collaboration group 2015, Bernhardt *et al* 2016). The findings of our service evaluation add to the small body of evidence supporting increased frequency of therapy or activity in mixed neurological inpatient populations (Saunders *et al* 2019, Slade *et al* 2002).

Slade *et al* (2002) and Saunders *et al* (2019) both investigated increased intensity of therapy

ANCOVA MODELS

Model	Dependent variable	Variables controlled for	Effect of the cohort on dependent variable	Pairwise comparisons		
				Comparison	Estimate	p value
1	Length of stay (days)*	Age and admission MRMI score	$F(2,112) = 8.69$ $p < 0.001$	2020 v 2018	$1.18^{\dagger}$	$p = 0.554$
				2021 v 2018	$0.63^{\dagger}$	$p = 0.015$
				2021 v 2020	$0.54^{\dagger}$	$p = 0.014$
2	Change in MRMI	Age and admission MRMI score	$F(2,112) = 5.14$ $p = 0.007$	2020 v 2018	-0.04	$p = 1.000$
				2021 v 2018	5.07	$p = 0.038$
				2021 v 2020	5.12	$p = 0.036$

Table 3

*log transformation performed on length of stay.
†exponential back transformation of estimate performed.

LOGISTIC BINARY REGRESSION MODELS

Model	Dependent variable	Independent variables	Odds Ratio	p value
A	Reduction in discharge rehabilitation needs admission to discharge	Cohort		
		2021	Reference	–
		2020	-0.65	$p = 0.581$
		2018	-19.1	$p = 0.995$
		Age	0.02	$p = 0.757$
		Admission MRMI score	0.41	$p = 0.238$
B	Number of patients with a tracheostomy who were decannulated	Cohort		
		2021	Reference	–
		2020	-0.72	$p = 0.141$
		2018	-0.85	$p = 0.084$
		Age	0.00	$p = 0.905$
		Admission MRMI score	0.13	$p = 0.002$

Table 4

input in NHS inpatient settings with samples with a mix of neurological conditions. Saunders *et al* (2019) reported that their pilot project of increased intensity of acute neurorehabilitation was associated with a larger reduction in length of stay of 27.6 days. Compared to our study, their pilot included larger increases in staffing across multiple Allied Health Professionals (physiotherapy, occupational therapy, speech and language therapy, and dietetics). This centre had a much higher baseline average length of stay of 87.3 days. (Slade *et al* 2002) conducted a randomised controlled trial (RCT) of usual care versus a 67% increase in physiotherapy and occupational therapy, in a mixed neurological rehabilitation population (60% of participants admitted following a stroke). There was no difference in functional independence with activities of daily living at discharge, but increased therapy when controlling for a number of confounders including impairment mix predicted a 14-day reduction in length of stay (p < 0.001) (Slade *et al* 2002).

This service evaluation provides some evidence that this patient cohort can in fact make significant functional improvements and may represent one of the populations that has a lot to gain from a higher frequency of therapy.

A score of more than 4.5 points has been reported as a clinically significant change in MRMI score (Lennon and Johnson 2000). This adds to the importance of our findings, as the 2021 sample showed an average increase of over five points compared to other cohorts, even with age and admission MRMI score controlled for. The MRMI is quick and easy to use in a clinical setting and had been used in previous years by the team so could be extracted from historical cohorts used. It has been shown to have high inter-rater reliability (ICC = 0.98; p<0.001) and high internal consistency (Cronbach's alpha = 0.93) (Lennon and Johnson 2000). However, the research into the psychometric properties of the MRMI is mostly in general elderly care and stroke rehabilitation rather than a neurosciences' population. The MRMI is not an outcome measure used as part of the UKROC dataset for specialist neuro-rehabilitation (Turner-Stokes *et al* 2012) and other studies discussed for comparison have used a range of different outcome measures, not including the MRMI, limiting the ability to make direct comparisons between studies. The main limitations to this study are the observational design, convenience samples and small sample sizes in each cohort. The observation design means that we cannot infer causality, as there may have been confounding factors not controlled for in the analysis. Due to financial restrictions, we took a pragmatic approach to the evaluation and used convenience samples; though we have tried to minimise potential bias, it is possible that selection bias occurred. Finally, due to financial restrictions the sample sizes were relatively low, and had insufficient power to detect differences in the binary outcomes between the cohorts.

Our pilot did not show any significant change in the number of patients with tracheostomies who were decannulated between the three cohorts. As well as insufficient power in the service evaluation, it is possible that an increase in staffing from other professions would be required to demonstrate significant differences. Tracheostomy weaning is multi-factorial and dependent on a multidisciplinary approach.

While the average number of face-to-face physiotherapy sessions was highest in the 2021 cohort as expected, it would have been useful to also gather information on the length of these sessions across cohorts, the number of exercise repetitions, the content of sessions, patient activity outside of physiotherapy sessions, and the time spent on activities such as liaising with the MDT, as these are all factors which if compared between cohorts could give further explanation and analysis into the differences in length of stay and functional independence. This detail was not possible due to the retrospective nature of the evaluation, and a lack of resources. Despite achieving the lower length of stay and greater changes in functional ability, results did show that in the 2021 cohort the median length of each rehabilitation session was 32.5 minutes which was shorter than the 45 minutes we aimed for. Limitations of this study include that we are unable to compare this figure to the other cohorts, and that we don't know why the 45-minute aim was not achieved, though possible reasons include patient tolerance and staff time pressures.

The eligibility criteria were used due to limited additional resource, as a way to focus on two specific patient populations and was not evidence based. Therefore, findings cannot be generalisable to the whole inpatient–neuroscience population. Patients with an MRMI 8-17 are typically at a functional mobility level whereby they are able to stand and potentially transfer to a chair but requiring assistance of one or two people. In a clinical setting with limited therapy resources and hospital pressures to prioritise patients who have the potential to be discharged imminently to help with hospital flow, this patient cohort often do not receive the regular therapy that is felt to be clinically indicated. This service evaluation provides some evidence that this patient cohort can in fact make significant functional improvements and may represent one of the populations that has a lot to gain from a higher frequency of therapy. The patient populations analysed include patients with a broad range of conditions and complex clinical presentations, that reflect a typical neurosciences' caseload in an acute NHS setting, increasing the clinical utility of the findings.

The 2021 cohort was between March and May whereas the 2018 and 2020 cohorts were between September and December. This difference may affect the comparability of the cohorts. The historic cohorts may have been affected by winter pressures, and it is possible that length of hospital stay was particularly affected by this. Also, the 2020 and 2021 cohorts were during the COVID-19 pandemic. Due to financial and team capacity pressures we were not able to better plan time periods for this service evaluation, so completed the 2021 pilot project with extra staffing at a time when the team had capacity to plan and execute this. We extracted data for the two historical cohorts from time periods whereby we had access to previous audit data.

Despite the limitations, this evaluation hopefully provides a convincing argument for a business case to permanently increase staffing. As with many clinical service evaluations we were limited in the resources we had and were not able to conduct a randomised research study. Future work may benefit from a greater resource to balance the short-term local clinical need with the need to demonstrate causality and generalisability to both wider patient populations and other hospitals and utilise efficient trial design such as stepped-wedge cluster design.

CONCLUSION

We were able to demonstrate that increased staffing in the 2021 cohort was associated with better hospital and patient outcomes. This work adds to the evidence of the cost-effectiveness of increased physiotherapy staffing in acute neurological settings. Further prospective research is needed to establish causality, generalisability, and causal mechanisms. This is an under-researched population, partly because studying it is complicated by its clinical heterogeneity, but it nevertheless represents the caseload of real-world clinical settings and studying it should therefore be given higher priority.

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I declare that the authors have no competing interests such as funding or financial interests that might be perceived to influence the results and discussion reported in this paper.

Exploring the current knowledge and practice of UK physiotherapists in functional neurological disorder:

a cross-sectional survey

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Functional motor disorder (FMD) is an inclusive range of motor abnormalities seen in patients with a functional neurological disorder (FND) (Nielsen *et al* 2014). Symptoms include abnormal gait, paralysis and dystonia which are medically unexplained, deeming it non-organic to a direct physiological cause (Espay *et al* 2018). The condition borders the interface of neurology and psychology based on the current knowledge on aetiology and neurological background, making it a complex disorder to treat.

> *People with FMD are commonly referred for physiotherapy; however, research to support evidence-based treatment is still evolving.*

Psychodynamic models suggest that non-organic symptoms may be due to supressed emotion or to escape interpersonal conflicts, repressed from an individual's conscious awareness (Espay *et al* 2018). While the pathophysiology suggests dysfunction across neural circuits affecting specific networks, with symptoms experienced as involuntary although voluntary pathways are utilised. Examples include attentional dysregulation caused by an impaired amygdala in processing emotions and greater activation in fronto-parietal networks (Boeckle *et al* 2016).

People with FMD are commonly referred for physiotherapy; however, research to support evidence-based treatment is still evolving. Physiotherapy recommendations for FMD have been developed from multidisciplinary expert consensus and research evidence and provide a clear framework on physiotherapy treatment principles (Nielsen 2014). The recommended strategies surround the biopsychosocial framework of FMD, highlighted in *Table 1*. The recommended strategies include diverting attention away from abnormal movement stemming from FMD's pathophysiology. The premise is to retrain movement by paving a way to treat the impaired pre-conscious level, to prevent the brain expecting abnormal movement. Behavioural approaches within the consensus statement are linked to the connection of possible emotional and interpersonal experiences (Gutkin *et al* 2020). Strategies include demonstrating the potential for reversibility through positive clinical signs which can strongly influence expectations of recovery and change illness beliefs. Furthermore, the use of language can help challenge maladaptive beliefs for individuals to acknowledge and manage stressors more effectively. As well as this, language can help automatically generated movements compared to descriptive wording focusing on the affected area in physiotherapy sessions (Gutkin *et al* 2020, Nielsen *et al* 2014). These components have been adopted in several clinical studies such as Czarnecki *et al* (2012), Jordbru *et al* (2014) and Nielsen *et al* (2015). Within Nielsen *et al* (2015) five-day inpatient physiotherapy programme, 47 FMD patients presented with gait disturbance, dystonia, weakness and other symptoms, and the physiotherapists used provided education on patients' diagnosis and treatment, diverted attention and incorporated behavioural components. Findings showed 65% of subjects had 'much or very much improved' and reduced to 55% at the three-month follow-up. In addition, they showed a Berg Balance Scale improvement from admission to discharge (39.9 ± 16.3 v 49.8 v 10.9).

A search of medical and physiotherapy databases did not reveal any studies that

FOUR KEY COMPONENTS OF PHYSIOTHERAPY IN TREATING FND	
1	Education
2	Positive signs of FND which demonstrate the potential for normal movement
3	Retraining movement with diverted attention
4	Other strategies (use of language, exercises – non-specific and graded, visualisation, mirrors and video, hypersensitivity, rehabilitation diary, pain and fatigue management, provision of equipment and Functional Electrical Stimulation)

Table 1 From (Nielsen *et al* 2014).

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examined physiotherapists' recognition and/or understanding of managing and treating FMD relative to the consensus statement. One of the few published studies by Edwards *et al* (2012) reported over one-half of 1,402 neurological physiotherapists reported having low self-judged knowledge of FND. Similarly, Lehn *et al's* (2019) online survey surrounding health practitioners' knowledge of FND reported 85% of physiotherapists did not feel well educated regarding FND. Overall, this highlights an accepted awareness of a gap in clinicians' knowledge of FMD. There is a need to further investigate physiotherapists' knowledge and what interventions physiotherapists are providing to individuals with FMD, relative to the consensus statement.

METHODS

This exploratory study aimed to:

1. Evaluate physiotherapists' knowledge, management, and treatment of FMD in the UK
2. Identify needs for educational and professional development in the management and treatment of FMD
3. Identify current limitations and barriers that may prevent physiotherapists from providing optimal care and treatment

Procedures

The study used Qualtrics, an online survey platform to build and distribute the survey. All surveys were returned in an anonymous format and were included in the analysis regardless of missing data; consequently, the total responses for each survey item varied. The questions included were reflective of the physiotherapy FMD consensus recommendations and consisted of 33 quantitative questions and five open-ended qualitative questions (Nielsen *et al* 2014).

The Association of Chartered Physiotherapists in Neurology (ACPIN) acted as the study's gatekeeper disseminating surveys alongside snowball sampling via social media.

Data analysis

Qualitative data was analysed using thematic analysis using an inductive approach and quantitative data was analysed using descriptive statistics.

Participants

Participants' inclusion criteria consisted of:

1. Qualified physiotherapist
2. Currently working in clinical practice as a physiotherapist in the UK
3. Treated patients with FND within the last two years

Ethical approval

The study gained ethical approval by Leeds Beckett University research committee.

RESULTS

Quantitative results

Demographics

A total of 139 participants responded to the survey with 98 completing all the questions. On average, participants had been in their professional role as a physiotherapist with a mean time of 3.02 years (standard deviation (SD) 1.37) with 22% (n=22) practising physiotherapy for greater than 20 years (*Figure 1*). In addition, 72% of respondents specialised in neurology (*Figure 2*). The most common settings in which participants treated FND patients were acute inpatients 23% (n=46) and physiotherapy outpatients 22% (n=43).

PARTICIPANTS' YEARS OF WORKING IN PHYSIOTHERAPY

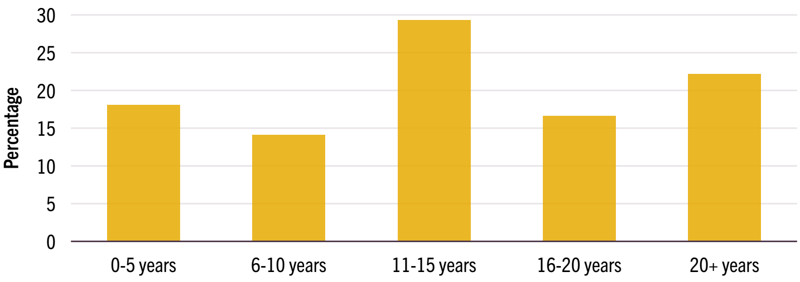


Figure 1

FREQUENCY OF PARTICIPANTS' SPECIALITY AREAS

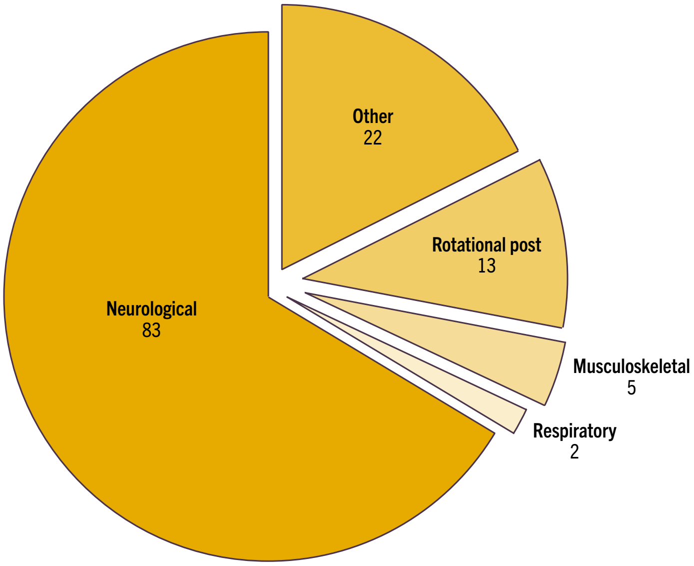


Figure 2 Total Number of Respondents = 125.

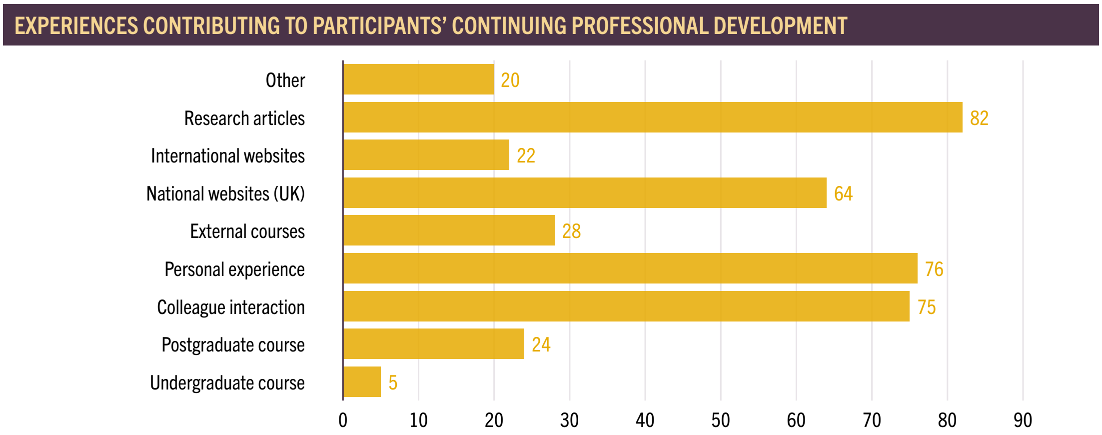

EXPERIENCES CONTRIBUTING TO PARTICIPANTS' CONTINUING PROFESSIONAL DEVELOPMENT

Figure 3 Percentage of "Which experience has contributed to your personal knowledge of treating people with FND?" (Total number of multiple selection = 415).

Education of FMD

Results showed notable differences among the types of experiences contributing to participant's knowledge of FND (*Figure 3*).

Regarding professional networks, 56% (n=74) of participants were members of ACPIN and 11% (n=15) were members of the FND society.

Approximately 78% (n=82) of the respondents were aware of the physiotherapy for FMD consensus recommendations. 81% (n=94) of respondents reported a need for a greater understanding of FMD. The survey also noted that 54% (n=57) of respondents reported their clinical intervention is 'somewhat' underpinned by evidence-based literature (*Figure 4*).

Knowledge, treatment and management of FND

Most participants agreed that FND is a part of the biopsychosocial framework (81%, n=84) while 18% (n=19) did not know. Most participants agreed that FND is commonly triggered by physical or psychological stress (94%, n=98) and 97% (n=101) agreed an MDT approach is required to treat FND. Only 60% (n=62) agreed on the conceptualisation that 'FND is conceived as an involuntary but learnt habitual movement pattern driven by abnormal attention', with 21% (n=22) reporting this to be false and 18% (n=19) not knowing.

Regarding holistic treatment, 100% (n=100) of respondents reported educating patients on the importance of fostering independence through self-management while 86% (n=85) include family and friends within the treatment. Additionally, 99% (n=99) acknowledge that symptoms are real and 96% (n=96) aim to demonstrate normal movement can occur.

Large differences surrounding attention-related approaches were seen (*Figure 5*). A consensus saw 69% (n=72) of participants incorporate redirecting attention away from the body to prevent abnormal movement while 22% (n=23) did not know and 9% (n=9) disagreed. Controversially, 44% (n=44) agreed to maximise self-focused attention towards the desired movement and 36% (n=36) use specific strengthening exercises. Differences were also seen related to facilitation as 65% (n=66) agreed to facilitate the desired movement and

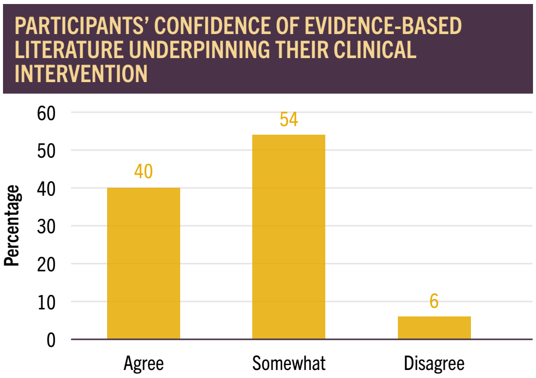

PARTICIPANTS' CONFIDENCE OF EVIDENCE-BASED LITERATURE UNDERPINNING THEIR CLINICAL INTERVENTION

Figure 4 "Are you confident that your clinical intervention is underpinned by evidence based literature?" (Total Number of Respondents = 105)

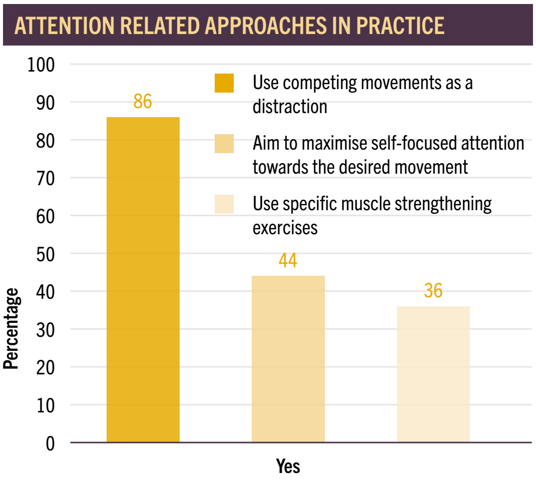

ATTENTION RELATED APPROACHES IN PRACTICE

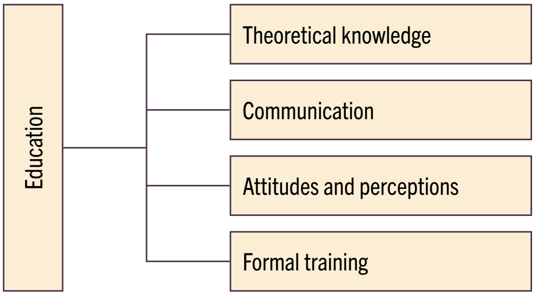
Figure 5

in contrast, 94% (n=94) agreed they 'limit hands-on treatment'.

Qualitative results

Two themes emerged from thematic analysis of the qualitative data. The first theme is education comprised of subthemes of theoretical knowledge, communication, attitudes and perceptions and formal training. The second theme was services comprised of subthemes of clinical environment, pathway and MDT services.

Theme 1: Education



Questions relating to the theoretical understanding of FMD formed a large response, predominantly related to informing appropriate physiotherapy management and treatment.

> *"Too many qualified professionals still believe it is a psychological condition and not neurological."*

> *"…better understanding of how to approach rehab, what to expect, possible solutions to barriers and to be able to better facilitate and empower the patient with rehab."*

A substantial number of participants identified the link between poor understanding of FND and communication. The explanation of the patient's diagnosis was overtly identified as poor among the multidisciplinary team (MDT) and was recognised as needing to be 'combated' as their role in educating patients on their diagnosis. It was identified the delivery of diagnosis is often 'non-optimal', with concerns of 'poor explanation' and 'unexplained diagnosis' that impacts the patient's 'understanding of the diagnosis'.

> *"Delivery of diagnosis – this is often done by inexpert doctors and not delivered well, affecting all ongoing treatment."*

The importance of good communication skills and the ability to explain a diagnosis appeared to correlate with patients' recovery outcomes. The consultant's role in educating patients came through strongly, highlighting when language has been appropriate it appears to influence patients' outcomes.

> *"Clients I assess and treat quite often have different outcomes depending on how/where they have been diagnosed. Without an appropriate consultation explaining FND from a specialist neurologist, this has an impact on initial rehab intervention and prognosis.".*

The complex relationship between theoretical knowledge of FND and the MDT's attitudes and perceptions of FND were reported, concerning the 'legitimacy' of patients' symptoms and 'truthfulness' of diagnosis related to feigning or malingering.

> *"Broader perception that the patient is 'putting it on' can lead to inconsistent approaches…"*

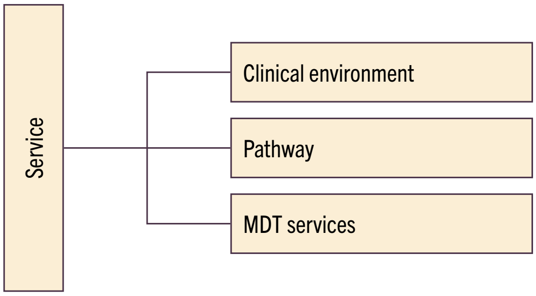
Participants described a greater understanding of FND would elicit objective conversations among the MDT allowing for greater objective explanations to legitimatise the condition.

> *"[With a] better understanding of the neurobiological changes, I would be able to have more objective conversations with medical staff…"*

Questions surrounding the need for educational development were identified due to the consistent theme of 'poor understanding' of FND, specifically the need for formal education within the University curriculum.

> *"Needs more recognition in undergrad teaching as people don't just present with FND on neurology or neuro rehab…"*

Theme 2: Services



An overriding concern was the lack of therapy pathways available for FND patients, raising concerns over 'health inequality'. Participants highlighted several barriers to providing optimal care for patients including time constraints, lack of multidisciplinary team input, inadequate referral pathways and services.

The healthcare environment appeared to be a barrier, as some participants expressed acute hospital settings limit rehabilitation progress next to lack of time.

> *"In the acute setting the main barriers include time – there is inadequate time to spend with patients to bleed their symptoms dry and gradually explain and build up their understanding…"*

A substantial number of participants identified the link between poor understanding of FND and communication.

Physiotherapy training relies on evidence-based practice as it integrates the best available, current and valid research to shape how the profession delivers patient care.
CSP 2018

Questions related to identifying barriers to providing optimal management and treatment elicited a variety of responses, predominantly conveying inadequate services and referral pathways for ongoing therapy.

> *"Many services won't accept patients with FND…"*

> *"Anecdotally FND seems to be becoming more common and there aren't good services or pathways to support them, resulting in (I'm assuming) poorer outcomes."*

Several participants described the limited access to the use of multidisciplinary services as a barrier, primarily the inability to receive psychological input for patients.

> *"Access to psychological intervention due to limited resources."*

DISCUSSION

The vast majority of respondents (78%, n = 82) were aware of Nielsen *et al's* (2014) FMD physiotherapy consensus recommendations. Though the knowledge underpinning respondents' interventions was inconsistent, this was more significant in physiotherapy interventions related to attention, language and facilitation domains compared to biopsychosocial advice. These differences likely correlate to the theme of education comprising poor theoretical knowledge and lack of formal training alongside limited evidence-based literature, as 81% (n=94) reported needing a better understanding of FMD, similarly seen in Lehn *et al's* (2019) study where only 35% of 538 healthcare professionals reported having a good knowledge of FND relative to aetiology, pathophysiology and treatment strategies.

Attention-related approaches in practice saw discrepancies compared to the consensus recommendations as 21% (n=22) of respondents disagreed or did not know (18%, n=19) whether or not FMD was conceived as an involuntary but learnt habitual movement pattern driven by self-direction attention. Relating this into practice, 69% (n=72) use diverting attention tasks while 44% (n=44) aim to maximise self-focused attention towards the desired movement. This suggests broad and inconsistent interventions within the current physiotherapy practice. As Brown's (2004) attention-related hypothesis states, the severity of functional symptoms will decrease by directing attention away from symptoms. This is further supported by Espay *et al* (2018) stating motor retraining aims to focus attention toward the goal of the movement rather than individual components, to reduce symptom severity with distraction. This can be seen in Jordbru *et al's* (2014) randomised control trial, consisting of a three-week inpatient rehabilitation programme (n=60) where participants completed functional adapted physical activities such as cycling or canoeing, incorporating educational and behavioural approaches, alongside a control group. Results showed the mean difference between treatment and no treatment was 6.9 functional mobility scale units, demonstrating functional, automatic tasks led to greater physical improvements. The use of language plays a huge role in the cognitive processing and execution of tasks. The current study found 76% (n=76) use automatic words when directing a patient to move, which Nielsen *et al* (2014) recommends to generate automatic movement, compared to 40% (n=40) using descriptive words, in what can be considered as shifting attention towards the symptoms, heightening the limbic system which debatably reinforces abnormal movement (Voon *et al* 2011).

Facilitation plays a key role in physiotherapy and can be approached in a number of ways, for example hands-on support instead of using adaptive walking aids (Nielsen *et al* 2014). Interestingly, 65% of respondents said they facilitated the desired movement to minimise abnormal movement patterns; when this question was reworded a different response was seen as 94% agreed to limit hands-on treatment, highlighting contradictions; therefore results should be interpreted with caution. Nonetheless, facilitating movement can in turn downplay the importance of an active participant and emphasises a top-down delivery to a passive patient; therefore, as an individual's confidence increases, the facilitation should be gradually removed, preferably with limited awareness (Hutting *et al* 2019, Nielsen *et al* 2014).

Conversely, respondents' knowledge of the biopsychosocial statements and approaches saw a majority of compatible results in keeping with the consensus recommendations.

Physiotherapy training relies on evidence-based practice as it integrates the best available, current and valid research to shape how the profession delivers patient care (CSP 2018). Currently, there is insufficient research within the field of FND, acknowledged by Nielsen *et al* (2013) and Nielsen *et al* (2014); hence there are no current guidelines. Consequently, the lack of research has likely contributed to the lack of evidence-based practice seen within the current study with inconsistent reports of knowledge and treatment, irrespective of those aware of the recommendations, as 54% (n=57) of respondents reported their intervention is 'somewhat' underpinned by evidence-based literature, while 6% (n=6) reported their intervention is not. This links to Lehn *et al's* (2019) findings which saw 85% (out of 195) of physiotherapists not feeling well educated on FND; alongside this, 41% of healthcare professionals disagreed to receiving adequate education about FND as a part of their training. This correlates to the current findings, in which undergraduate physiotherapy courses contributed the least to clinicians' knowledge of FND (5%, n=5). Also heavily reported in the qualitative data was the need for FMD to be introduced within the university curriculum to bridge the gap of knowledge displayed within this current study. The study proposes strong evidence for the teaching of FMD to be introduced into the university curriculum. Lehn *et al* (2020) demonstrated that a two-day educational course for healthcare practitioners incorporating a multidisciplinary approach was effective in improving clinicians' knowledge and confidence in assessing and managing FND patients, and reported a carry-over of knowledge present at the six-month follow-up. This is encouraging as the implementation of teaching could have a significant impact on the care patients receive.

An incidental finding reported poor delivery and explanation of providing functional diagnoses among other members of the MDT and was partially linked to the perceived lack of knowledge and understanding of the diagnosis. From this, therapists should be mindful to provide a clinical explanation; this is supported within the data as it was found some physiotherapists are readdressing a poor diagnosis explanation as a good explanation alone is a therapeutic tool and can lead to significant improvement of symptoms and is widely seen within the current literature (Stone *et al* 2016, Nielsen *et al* 2014).

A recurrent theme expressed among the qualitative data was the inadequate healthcare services for FND patients, raising concerns of health inequity. Respondents highlighted patients are not being referred early enough to physiotherapy. This can be seen in O'Keefe *et al's* (2021) study at the start of an FND patient's healthcare journey as FND patients waited significantly longer than MS patients for a consultation, greater than six months (seven MS patients v 29 FND patients, $p < 0.001$) and received a definite diagnosis of greater than twelve months (twelve MS patients v 26 FND patients, p 0.001). This prolonged waiting time may contribute to patients' potential recovery outcomes within physiotherapy as abnormal movement patterns may be further reinforced due to the time disparity. As Healthcare Improvement Scotland (2012) reported, timely interventions ranging from informative and educational advice from the neurologist to complex rehabilitation interventions could decrease patients' disability and distress. This idea is supported by Aybek *et al* (2020), who identified patients attending specialised FND clinics in Switzerland who were hospitalised in the acute phase of their symptoms tended to have a shorter duration of symptoms (2.3 years) compared to United Kingdom (5 years) and Canadian (4 years) clinics, who were referred to as outpatients. These findings have important implications for developing healthcare services likely correlating with decreased consumption of healthcare resources (Healthcare Improvement Scotland, 2012).

Inadequate referral pathways was a dominant theme, where a lack of specialist pathways and common refusal of referrals based on the diagnosis of FMD was reported. The disparity appears to have led to patients falling through the healthcare gap and because of this Healthcare Improvement Scotland (2012) proposed a stepped care approach for the FND model in which a clear care pathway was formed to direct healthcare practitioners towards appropriate treatments depending on the patients' needs. The outline acknowledged FND patients do fall through multidisciplinary team services. The difficulties in accessing services and healthcare professionals reflect problems in the structure and coordination of care for FND patients. Developing specialist multidisciplinary services nationwide will provide outreach and support to community services, thereby improving clinicians' skills and confidence in treating individuals with FND. In addition to this, the current study reported limited access to multidisciplinary services, predominantly neuropsychology. This finding is consistent with that of Edwards *et al* (2012) who identified inadequate psychological input and is highly important based on the disorder's aetiology and that a multidisciplinary approach is strongly advocated within Nielsen *et al's* (2014) consensus recommendations. Some may argue that because of the lack of multidisciplinary services reported in the current study, greater emphasis is placed on physiotherapists' lone interventions and may link to poorer outcomes as reported within the study. For this reason, each therapist has the potential to exert a therapeutic psychological effect, as stated by Nielsen *et al* (2013), specifically conducting a detailed assessment to 'drain the symptoms dry' and offer diagnosis validation. In this survey 99% of respondents reported they do acknowledge that the patients' symptoms are real. However, services should be reviewed to achieve optimal care for these patients.

> *… a good explanation alone is a therapeutic tool and can lead to significant improvement of symptoms…*

STRENGTH AND LIMITATIONS

This is the first cross-sectional survey that explores physiotherapists' knowledge, management, and treatment of FMD, assessing the need for educational and professional development and current limitations that may prevent physiotherapists from providing optimal treatment. It has generated a preliminary

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Funding
I can confirm that this piece of research has not been published elsewhere and has not been submitted to another journal simultaneously.

Declaration of interest
This study did not attain any financial benefits or funding to complete the project. In addition, there were no conflicts of interest.

picture that can inform practice developments and future research. The study was subject to limitations, the first being that not all the key elements within Nielsen *et al's* (2014) physiotherapy FMD consensus recommendations were included within the survey. In addition, the survey may have been susceptible to response bias, surrounding purposive and snowball sampling with engaged physiotherapists responding more readily than those who do not have an interest in this area, potentially leading to an over-representation. Lastly, the survey was unable to control for potential biased outcomes such as the Hawthorne effect with respondents answering in a way that is consistent with the researchers' expectations.

CONCLUSION

The study's findings demonstrate inconsistent gaps among physiotherapists' knowledge, management, and treatment, with participants perceiving a need for a greater understanding of FMD. This is despite many respondents reporting that they were aware of the FMD physiotherapy consensus recommendations. This may reflect insufficient research within the physiotherapy field, adding greater weight for evidence-based guidelines. In addition, the current services for FMD were viewed as inadequate, where there were discrepancies of limited-service pathways among the acute, rehabilitative and community settings, as well as limited access to psychological services. Lastly, respondents identified a need for the teaching of FMD to be introduced within the university curriculum, to create a standardised care for future physiotherapists.

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Early gait re-education training following stroke: a report from the Forward Orthotic Thinking Conference 2021

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A conference conducted on Jan 16th, 2021 was organised by the authors to bring together approaches in orthotics and neuro-developmental treatment known as Bobath, in adult neuro-rehabilitation. In the Western world, the Bobath concept is one of the most popular treatment approaches used in stroke rehabilitation, yet the optimal type of treatment has not been established through evaluative research.

The use of orthotics is becoming increasingly common in achieving positive rehabilitation outcomes for patients following stroke. The Bobath approach is complex, and several studies have explored professionals' views on its definition. In one study, UK physiotherapists described the approach as including facilitation of movement, mobilisation and practising components of activities. In contrast, a biomechanical approach more commonly used by orthotists focuses on the use of orthoses to optimise distal lower limb alignment to promote more normal demands and responses on proximal segments of the body. The two concepts rarely overlap with clinicians tending to elect for one approach when determining patient treatment plans following stroke. Designed as a multidisciplinary event, the conference content was intended to bring together the two approaches focused on stroke rehabilitation. While the emphasis was on neuro-rehabilitation in early gait re-education, it was intended that the topics covered would have wider applicability and be of interest to those specialising in other fields and approaches where there is a crossover of clinical reasoning and skills. In keeping with COVID-19 pandemic restrictions on group gatherings, the event was held virtually using a remote teleconferencing platform which facilitated a wider audience across the UK and internationally. The conference was advertised through clinical and research networks as well as via the Association of Chartered Physiotherapists in Neurology (ACPIN) and British Association of Prosthetists and Orthotists (BAPO) email circulation lists.

Presentations and discussions centred on an evidence review of gait re-education following stroke, considering Bobath and biomechanical approaches, relevant clinical considerations, case studies of practice and recent research studies conducted. The conference culminated in an open panel question and answer session with all presenters and facilitators, and networking virtual rooms where future research priorities in the area were considered.

The conference opened with a medical overview of stroke epidemiology and early intervention from a treatment and surgical perspective which set the scene for rehabilitation approaches. The presentation which followed was delivered by a Bobath tutor and described the pathways and mechanisms associated with gait, and how working with patients to inhibit compensations allows them to access more normal movement. Following this, two lead physiotherapists from the stroke unit at the Wolfson Neurorehabilitation Centre in London described and illustrated with case studies how orthotist intervention through early casting and use of temporary orthotic devices has been a successful aspect of their therapy approach. This was followed by an overview of physiotherapy intervention before the formal presentations concluded with an overview of orthotic options and a proposal as to how optimising alignment may contribute to motor learning and recovery as well as managing deficits. Following formal presentations, delegates were invited to join unstructured discussion groups.

> *The use of orthotics is becoming increasingly common in achieving positive rehabilitation outcomes for patients following stroke.*

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METHODS

Throughout the conference sessions, delegate interaction was encouraged through a series of live polls. The primary purpose of the polls was to capture a cross-disciplinary snapshot of clinical practice and views on the place of orthotics within early gait re-education following stroke, from clinicians practising in the field of stroke rehabilitation.

Favourable ethical approval was granted by Teesside University School of Health & Life Sciences Research Ethics sub-Committee, 17th February 2021). Data were analysed using Microsoft Excel and the statistical package STATA (version 13). Data are presented using descriptive statistics and summarised with actual numbers and percentage results included.

It is also, therefore, often the physiotherapist who acts as the gateway for other interventions including orthotics, to be introduced in early gait rehabilitation following stroke as an adjunct to physical therapy.

RESULTS

The conference was attended by 251 delegates who joined remotely from the United Kingdom, Ireland, France, United States of America and Belgium. Response to poll questions was not mandatory and so response rate is shown as (n=) for each question. Delegates were asked to identify their professional background with 90% of attendees physiotherapists, 9% orthotists, and 1% occupational therapists, physicians or nurses (n=209). Length of experience was varied; however the majority of delegates were very experienced with 59% of attendees having been qualified for over ten years (n=220).

Eighty-three per cent of respondents said it was the physiotherapist who determines the patient's orthotic rehabilitation need (n=224), with 34% stating they felt they 'fully understand what therapy/orthotic interventions offer, well enough to integrate them into their treatment plan for a patient' (n=215). Access as a barrier to orthotic treatment was highlighted with 56% of respondents stating they found 'orthotist led assessment or intervention accessible but difficult to arrange or not accessible at all' (n=197). Correspondingly, 93% of respondents indicated that they would 'like to see greater access to orthotist led assessment and intervention' (n=215). The significant majority of delegates that responded (98%) stated that they felt that orthotic interventions are either 'very important' or 'important' in helping to achieve stroke patients' rehabilitation goals (n=214), and all respondents said they would 'like to see closer working and greater knowledge exchange between the orthotist and the rest of the stroke MDT' (n=204).

When asked "what percentage of the stroke patients you see do you consider would benefit from some form of orthotic assessment or intervention whether temporary or longer-term?", over 80% of respondents reported that more than 40% of patients would benefit, while over 30% of delegates reported that over 70% of patients would benefit (n=216). More than 50% of delegates reported 'orthotic interventions as being very important in helping to achieve stroke patients' rehabilitation goals' (n=214).

Throughout the course of the conference, research recommendations were generated and through discussion have been categorised into three major domains of interest. Classification of normal and pathological gait across professions; use of orthotic assessment tools within rehabilitation; access to orthotic assessment and orthotist place within the wider stroke MDT.

DISCUSSION

The FORTH conference brought together clinicians from different backgrounds and different countries all with expertise in gait re-education following stroke. The presentations, discussions and results of the poll survey highlight the important relationship between physiotherapists, orthotists and the wider stroke rehabilitation MDT when forming early gait re-education treatment plans which incorporate orthotic interventions. It is accepted anecdotally that physiotherapists are considered to lead the identification and treatment of gait rehabilitation for stroke patients and this was reflected in the responses from the attendees' polls. It is also, therefore, often the physiotherapist who acts as the gateway for other interventions including orthotics, to be introduced in early gait rehabilitation following stroke as an adjunct to physical therapy. The relationship between the physiotherapist and the wider stroke rehabilitation team including the orthotist is therefore an important one. The poll outcomes highlighted specifically how there is scope for differing approaches such as neuro-developmental treatment and biomechanical orthotic thinking to be used in conjunction with each other and there is potential for this to be explored further across clinical settings.

The conference attracted a majority of physiotherapist delegates, which may suggest a degree of interest in orthotic approaches to rehabilitation in adult neuro rehabilitation within the physiotherapy community. Additionally, almost all delegates indicated orthotic interventions are either 'very important' or 'important' in helping to achieve stroke patients' rehabilitation goals, which reinforces the perceived significance of the orthotist and the use of orthoses in post stroke gait re-education alongside neuro-developmental treatment methods. Attendees may disproportionately represent those with an interest in the idea of orthotic treatment in stroke though findings from the polls are consistent with previous research in the area.

CONCLUSION

The FORTH conference was an opportunity to bring together different approaches to early gait re-education following stroke and encourage discussion and collaboration between clinicians. The poll results highlighted areas that require further investigation and the desire for changes to be made to how orthotics provision is delivered in stroke rehabilitation settings. We consider closer links between professions with cross-working of therapy approaches offer the potential for greater knowledge exchange and thus better outcomes for stroke patients.

Barriers in the form of difficulties with access to orthotists and orthoses provision need to be addressed before improvements can be made, with consideration of how services are commissioned and the impact of low number of orthotists internationally. The authors believe the conference has highlighted the need for a wider understanding of the contribution of both physiotherapists and orthotists to the wider stroke rehabilitation community and support further evaluative research in this area.

Future planning of both stroke and orthotic services should encourage ongoing dialogue and research into different therapy approaches and seek to identify how orthotic and physiotherapy treatments can be best delivered and contribute to best outcomes for stroke survivors.

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APPENDIX 1

Q1 WHAT IS YOUR CLINICAL ROLE/TITLE?

	n=209	%
Physiotherapist	188	90
Orthotist	18	9
Occupational Therapist	1	<1
Physician	1	<1
Nurse	1	<1
Other	0	–

Q2 HOW LONG HAVE YOU BEEN QUALIFIED?

	n=220	%
0–2 years	11	5
3–5 years	27	12
6–10 years	52	24
More than 10 years	130	59

Q3 HOW REGULARLY DO YOU SEE STROKE PATIENTS IN YOUR NORMAL CLINICAL CASELOAD?

	n=225	%
More than one a day	120	53
About once a day	19	9
Several times a week	55	25
About once a month	21	9
Several times a year	10	4

Q4 HOW SOON AFTER THE STROKE EVENT WOULD YOU NORMALLY SEE THE STROKE PATIENT? SELECT ALL THAT APPLY

	222 respondents
First 24 hours	30
First week	46
First month	73
Between 2–6 months	88
Between 7–12 months	50
Later in rehabilitation	36
Established patient	23

Q5 WHAT PERCENTAGE OF THE STROKE PATIENTS YOU SEE DO YOU CONSIDER WOULD BENEFIT FROM SOME FORM OF ORTHOTIC ASSESSMENT OR INTERVENTION WHETHER TEMPORARY OR LONGER-TERM? 0–100%

	n=216	%
0–10%	4	2
11–20%	18	8
21–30%	32	15
31–40%	41	19
41–50%	26	12
51–60%	29	13
61–70%	18	8
71–80%	25	12
81–90%	15	7
91–100%	8	4

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Declaration of interests

PC is employed by Peacocks medical group, a medical device company who organised the conference. The authors declare no other known conflicts of interest.

Q6 IN YOUR EXPERIENCE WHO IS IT THAT DETERMINES A PATIENT'S ORTHOTIC NEED?

	n=224	%
Physiotherapist	186	83
Orthotist	35	16
Occupational Therapist	0	–
Physician	0	–
Other HCP	0	–
Patient	3	1

Q7 IN YOUR EXPERIENCE HOW ACCESSIBLE IS ORTHOTIST LED ASSESSMENT OR INTERVENTION?

	n=197	%
Very accessible	23	12
Reasonably accessible	63	32
Accessible but difficult to arrange	87	44
Not accessible at all	24	12

Q8 IN YOUR OPINION WOULD YOU LIKE TO SEE GREATER ACCESS TO ORTHOTIST LED ASSESSMENT AND INTERVENTION?

	n=215	%
Yes	200	93
No	0	–
Not sure	15	7

Q9 IN YOUR OPINION WOULD YOU LIKE TO SEE CLOSER WORKING AND GREATER KNOWLEDGE EXCHANGE BETWEEN THE ORTHOTIST AND THE REST OF THE STROKE MDT?

	n=204	%
Yes	204	100
No	0	–
Not sure	0	–

Q10 IN YOUR OPINION HOW IMPORTANT ARE ORTHOTIC INTERVENTIONS IN HELPING TO ACHIEVE STROKE PATIENT REHABILITATION GOALS?

	n=214	%
Very important	110	52
Important	99	46
Not sure	5	2
Not really important	0	–
Not important at all	0	–

Q11 DO YOU FEEL YOU UNDERSTAND WHAT THERAPY/ ORTHOTIC INTERVENTIONS OFFER WELL ENOUGH TO INTEGRATE THEM INTO YOUR TREATMENT PLAN?

	n=215	%
Yes fully	74	34
I think so	117	54
Not sure	10	5
Partially	14	7
Not at all	0	–

APPENDIX 2

FORTH CONFERENCE 2021 PROGRAMME

9.30am	Welcome and introductions	
9.40am	An overview of stroke and rehabilitation indicators	**Dr Akif Gani**, Consultant stroke physician and geriatrician with specialist interest in elderly neurorehabilitation, Newcastle-upon-Tyne Hospitals NHS Trust
10.15am	Posture and movement priorities for walking – a Bobath perspective	**Paul Johnson**, Specialist neurological physiotherapist, Newcastle-upon-Tyne Hospitals NHS Trust/ Bobath Tutor
10.50am	A biomechanical approach to gait rehabilitation following stroke	**Isabel Carey** and **Elizabeth Williamson**, Neurophysiotherapist and orthotic specialist, St George's University Hospitals NHS Trust
11.25am	Coffee break	
11.35am	An overview of physiotherapy options	**Helen Lindfeild**, Consultant therapist in neurorehabilitation, St George's University Hospitals NHS Trust/Bobath tutor
11.45am	Orthotic options in gait rehabilitation following stroke	**Paul Charlton**, Orthotist, Peacocks Medical Group, Newcastle-upon-Tyne
12.20pm	Discussion, questions and polls	
12.40pm	Networking breakout rooms and close	

Click here for further details on presentations and a recording of the event.

The use of activity monitors to increase physical activity of patients on an acute stroke unit: a feasibility study

Miss Sarah Paterson[1], **Professor Jane Burridge**[2], **Dr Louise Johnson**[3]

The amount of physical activity undertaken by patients early after stroke has an impact on length of stay and functional outcomes (Askim *et al* 2014, Hokstad *et al* 2015). There is evidence demonstrating low activity in people in hospital following stroke (Bernhardt *et al* 2007, Askim *et al* 2012, Skarin *et al* 2013, Hokstad *et al* 2015, English *et al* 2016, Lay *et al* 2016).

> *Increased activity has been demonstrated where patients are proactively involved in setting activity related goals in response to feedback, whereas there was no change when patient goals were set by therapists.*

In 2004, Bernhardt and colleagues highlighted that patients on stroke units were ‘inactive and alone’ and physically active for only 13.9% of the therapeutic day (Bernhardt *et al* 2004). Subsequent literature continues to demonstrate low inpatient physical activity after stroke (Egerton *et al* 2006, Kunkel *et al* 2015, Lacroix *et al* 2016, Lay *et al* 2016, Simpson *et al* 2018).

Activity monitors are wearable, portable electronic devices that provide feedback on physical activity (Lynch 2018). This feedback may promote behavioural change through increased awareness, motivation and goal setting (Bravata *et al* 2007, Rasmus Tolstrup *et al* 2018). Currently ward routine and culture reduce patients’ physical activity (Bernhardt *et al* 2007, Lacroix *et al* 2016). The use of monitors as an intervention to provide feedback may enable awareness and accountability of patient physical activity levels for patients and staff.

Recent studies using monitors to increase activity in stroke units show conflicting results (Mansfield *et al* 2015, Kanai *et al* 2017, Masashi *et al* 2018). Increased activity has been demonstrated where patients are proactively involved in setting activity related goals in response to feedback (Kanai *et al* 2017, Masashi *et al* 2018), whereas there was no change when patient goals were set by therapists (Mansfield *et al* 2015). Increasing nursing involvement in patient activity can improve activity levels on the ward (Bernhardt *et al* 2008, van de Port *et al* 2012) suggesting if nursing staff have opportunity to engage in the extent to which patients are active, increase in patient activity may occur.

There is limited evidence for the use of activity monitors as an intervention to increase activity in those who are less mobile following stroke. In this study, we included participants who were unable to walk, but able to stand with or without assistance or equipment, and therefore to participate in attempts to increase upright activity. This allowed us to determine the feasibility of an activity monitor intervention for a wider range of physical disability in the early stages of recovery following stroke.

The overall aim of the study was to determine the feasibility of using activity monitors as a source of feedback for patients and staff on an acute stroke unit. We also sought to understand how feedback should be given to impact both clinician and patient behaviour to improve physical activity in those who can stand following stroke.

The specific objectives were to investigate:

- recruitment to the study and resulting participant characteristics
- use of activity monitors to understand patient activity on an acute stroke unit
- feasibility and acceptability of the intervention and study procedures
- participant response to the intervention

METHODS

Study design and participants

A mixed method design was used to understand the feasibility and acceptability of the use of activity monitors to provide feedback regarding patient activity on an acute stroke unit. Participants were randomised to a patient or staff feedback group, and qualitative

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3 Consultant Therapist, University Hospitals Dorset, Royal Bournemouth Hospital, Castle Lane East, Dorset.

data collected through interviews and focus groups. Ethical approval was obtained from the London-Surrey Borders Research Ethics Committee (reference: 18/LO/0628). Informed consent was obtained from each participant prior to recruitment.

The study took place on an acute stroke unit within the NHS in the UK. The monitors used were ActivPAL3™ micro (PALTechnologies Ltd, Glasgow, UK). These are small thigh-worn monitors that use accelerometer information about thigh position and acceleration to determine body position (sitting/lying and standing), transitions between postures and stepping which record continuously during use (Edwardson *et al* 2015).

Eligibility criteria were: new diagnosis of stroke, medically stable, capacity to consent, and ability to stand with or without assistance or equipment (including mechanical standing aids). Individuals were excluded if out of bed activity was prevented, they were receiving end of life care, had poor skin integrity contraindicating monitor use or were unable to understand monitor feedback. The study originally had an exclusion of participants with a MoCA score below 20 to ensure sufficient cognition to follow instructions. This was amended with ethical approval to those whose communication or cognition impairment limited their ability to understand information regarding their activity.

The study aimed to recruit 20 participants, which was considered sufficient to determine the feasibility of using monitors as an intervention to provide activity feedback based on numbers of patients admitted to the stroke unit.

All patients were screened on admission to the stroke unit, and re-screened daily against inclusion/ exclusion criteria. Eligible patients were approached by a member of the therapy team who explained the nature of the study and gave written information. For those willing to take part, informed written consent was obtained.

Measures

The following participant demographics were collected: National Institute of Health Stroke Scale (NIHSS)(Brott *et al* 1989) on admission, Montreal Cognitive Assessment (MoCA)(Cumming *et al* 2013), Barthel transfer score (Wade and Collin 1988), type of stroke and days since stroke at point of enrolment. Information regarding reasons for screening participants out of the trial was also collected.

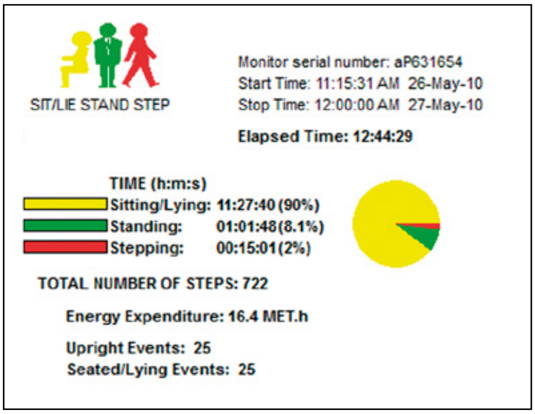
The primary outcome was percentage time standing each day. Secondary outcomes were percentage time lying/ sitting, and stepping; and number of stands and steps.

Feedback intervention

An information session for stroke unit staff explained the study aims, and expectations of provision of activity feedback. Written information about the study was provided and the researcher was available for provision of further information.

Activity monitoring

ActivPAL3™ micro monitors were worn by participants on their unaffected thigh for seven days. The monitor was worn continuously, except when removed daily for data download. This occurred at the beginning of each day and the monitor was re-attached immediately afterwards. Data were collected for twelve hours from the point of reattaching the monitor. Feedback was presented in the form of a pie chart as dictated by the ActivPAL™ software (*Figure 1*).



SIT/LIE STAND STEP

Monitor serial number: aP631654
Start Time: 11:15:31 AM 26-May-10
Stop Time: 12:00:00 AM 27-May-10

Elapsed Time: 12:44:29

TIME (h:m:s)
🟨 Sitting/Lying: 11:27:40 (90%)
🟩 Standing: 01:01:48 (8.1%)
🟥 Stepping: 00:15:01 (2%)

TOTAL NUMBER OF STEPS: 722

Energy Expenditure: 16.4 MET.h

Upright Events: 25
Seated/Lying Events: 25

Figure 1 Example of printed activity feedback information

Participants were assigned to a patient or staff feedback group using a computer-generated stratified random number sequence ensuring equal distribution according to the Barthel Index transfer score (Wade and Collin 1988).

- **Patient feedback group (PF)** Participants received printed activity monitor feedback daily from the main researcher. The information was explained, and verbal suggestions made to improve physical activity. Examples included walking to the bathroom rather than using a wheelchair, or practising sit to stand when visitors were present.
- **Staff feedback group (SF)** Activity monitor feedback was given to stroke unit staff looking after the patient. It was placed in end of bed notes and visibly in the multidisciplinary team office. The main researcher ensured the nurse looking after the patient was aware of the information and asked them to help increase their activity on the ward with similar examples as for PF.

Interviews and focus groups

The main researcher conducted audio-recorded, semi-structured interviews (up to 30 minutes) with each participant who completed monitoring, and separate nursing and therapy focus groups (one hour) to explore participant and staff views on their experience of using the monitor and physical activity on the ward (interview and focus group schedules are detailed in *Appendix 1*).

Data analysis

Day one data for each participant were used to provide an activity baseline. These were descriptively analysed to understand activity undertaken without feedback.

Response to activity feedback was measured using activity data from participants who completed more than two days of monitoring. Data were analysed descriptively, using visual representation to determine aspects suggesting potential for feedback to increase activity. Interviews and focus groups were transcribed and analysed using thematic analysis (Braun and Clarke 2006).

RESULTS

Screening and eligibility

142 patients were screened between 22 October and 21 December 2018. The largest reason for exclusion was imminent discharge (28.7%) and only 14 participants were eligible for inclusion. Ten participants commenced baseline monitoring. One participant withdrew due to intervention load, and five were discharged prior to completion of the intervention, leaving four who completed the feedback intervention (*Figure 2*).

The study information session was attended by eight therapists, two doctors and two nurses.

Participant characteristics

Characteristics of the two groups were largely similar and representative of the target population. SF had a higher NIHSS on admission (*Table 1 – overleaf*).

Baseline activity data

Independently mobile participants demonstrated greater percentage time standing (mean 6.1%, sd 0.85) than those requiring assistance of one (mean 1.98%, sd 1.10) or two (mean 1.6%, sd 0.79). Maximum time standing in a twelve-hour time period for an independently mobile participant was 6.7% (48 minutes), and for participants requiring assistance was 3.5% (25 minutes) per day. Every participant spent more than 90% recorded activity time lying/sitting (*Table 2 – overleaf*).

Activity recorded with feedback

No problems were reported in relation to monitor use, and no adverse events were recorded. Physical activity remained low throughout the period of monitoring irrespective of ability to mobilise (*Figures 3a, 3b and 3c – overleaf*). Activity was monitored effectively throughout the recording period for all four participants (one of whom was discharged at day five). There were insufficient data to comment on changes in activity or differences between feedback groups. PF group received daily feedback from the main researcher but implementing SF was more challenging and therefore participants in this group did not always receive the feedback expected.

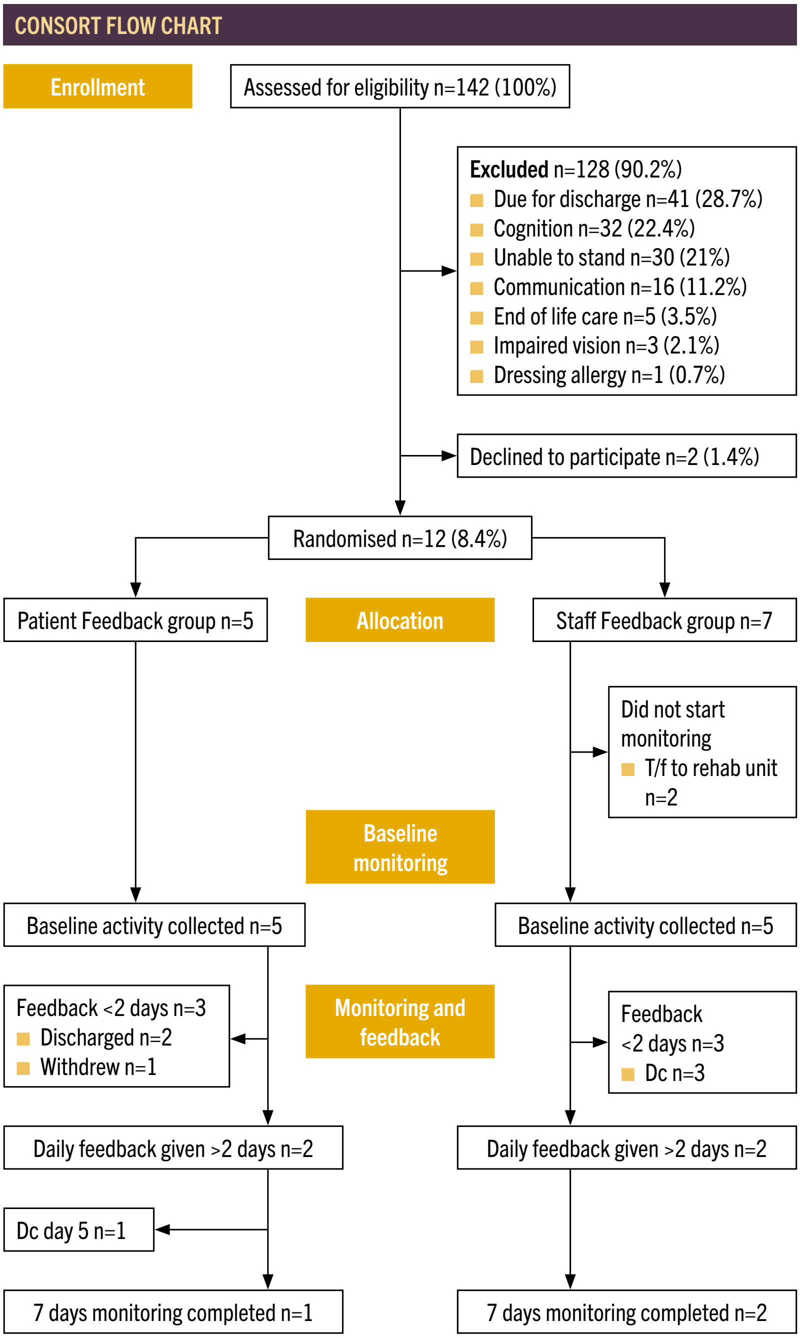


Figure 2

PARTICIPANT CHARACTERISTICS

Median (range)	All participants (n=12)	Patient feedback group (n=5)	Staff feedback group (n=7)
Gender (M)	5	2	3
Age (years)	78 (53–93)	72 (53–91)	81 (68–93)
Time since stroke (days)	9 (6–25)	9 (6–18)	9 (7–25)
NIHSS	8 (3–16)	4 (3–13)	12 (4–16)
MoCA	18 (6–29)	19 (6–29)	17 (10–23)
Barthel tf score			
Ind (n)	2	1	1
AO1 (n)	4	1	3
AO2 (n)	6	3	3

Table 1

MEAN ACTIVITY DEMONSTRATED AT BASELINE

Mean scores (range; s.d)	Independent (n=2)	AO1 (n=5)	AO2 (n=3)	All participants (n=10)
% Time standing	6.1 (5.5–6.7, **0.85**)	1.98 (0.4–3.5, **1.10**)	1.6 (1.0–2.5, **0.79**)	2.69 (0.4–6.7, **2.0**)
% Time lying/sitting	92.45 (91.8–93.1,**0.92**)	97.54 (95.8–99.5, **1.34**)	98.37 (97.5–99, **0.78**)	96.77 (91.8–99, **2.5**)
% Time stepping	1.45 (1.4–1.5, **0.07**)	0.48 (0.1–1.0, **0.36**)	0.03 (0–0.1, **0.06**)	0.54 (0–1.5, **0.58**)
Number of stands	15 (14–16, **1.41**)	13 (5–24, **8.69**)	7 (6–8, **1.0**)	9.57 (5–24, **6.69**)
Number of steps	402 (222–582, **254.6**)	194.8 (42–492, **176.85**)	12 (2–22, **10**)	202.93 (2–582, **203.97**)

Table 2 AO1 = assistance of one person to mobilise.
AO2 = assistance of two people to transfer.

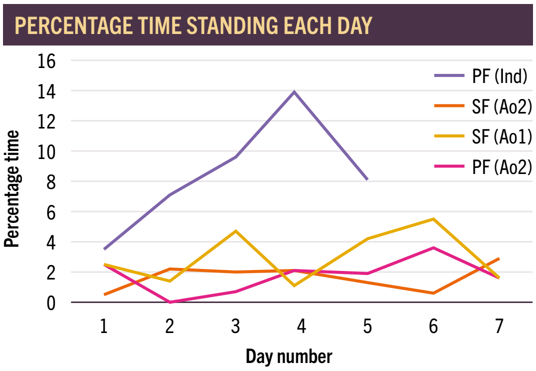


Figure 3a

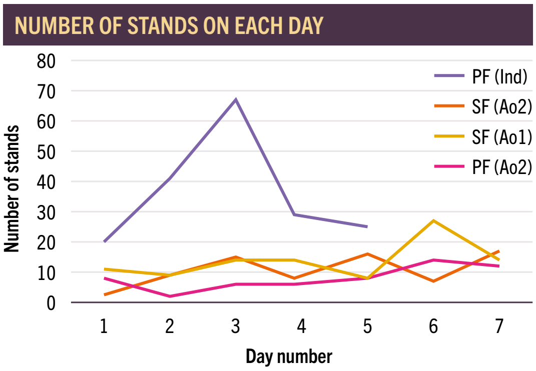


Figure 3b

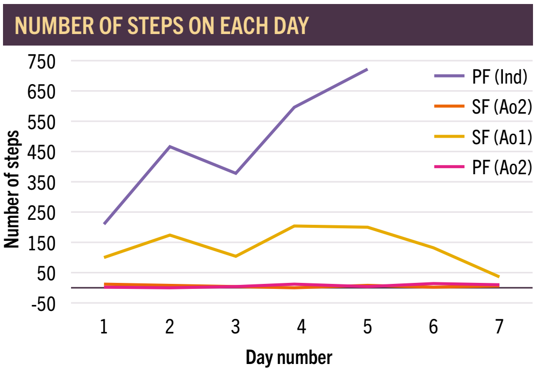


Figure 3c

Interviews and focus groups

Participants reported that monitors were comfortable and provided feedback which was easy to understand. They did not think the monitor itself affected their activity. Both patients and staff reported number of stands might be more useful than percentage time standing as a target to increase activity. Number of steps were only considered to be useful to the mobile participant (*Figures 3b and 3c*).

Four themes were identified from the interviews (n=3) and focus groups (nurses, n=5; therapists, n=5) (*Figure 4*).

Awareness

Patients and staff acknowledged the need to increase physical activity. Patients found the feedback useful as a focus on activity and a purpose for further discussion. There were differences demonstrated in nurses and therapists' perceptions of patient activity. Therapists were surprised by the extent of patient inactivity on the ward compared to nurses, whilst nurses presumed that mobile patients were provided with opportunities for activity.

All staff thought feedback could be a useful tool to improve patient activity on the ward:

> *"… [participant] needed supervision [to mobilise], but was desperate to do more walking, so if the nurses are aware of that and have something they are monitored on as well that would help." (Physiotherapist 2)*

Monitors for motivation

SF participants (n=2) did not receive the feedback expected and were less motivated to be active. The PF participant found the 'wheel' (pie chart) in the feedback helpful to try to improve her activity by increasing the "amount of green each day" (standing activity).

Clinicians and patients considered the monitors would have potential use as a motivational tool:

> *"Maybe join with nurses, so it's not just us, … so at the end of the day you can see what you've achieved … so you've got an incentive as well." (Occupational Therapist 1)*

Ward culture and daily routine

A barrier to improving physical activity was time. Therapists stated they were unable to be aware of individual patient activity outside of therapy sessions, and nursing staff reported lack of time to help those who required assistance. In SF, implementation of feedback was challenging due to additional task requirements for staff.

Ward routine dictated practices which reduced opportunity for patient activity. Ideas for changing practice and incorporating activity into ward routine were suggested by both nursing and therapy staff. For example:

> *"… incorporating measurement of patient activity into a ward audit like hand hygiene." (Nurse 1)*

All staff acknowledged the need for change in ward ethos to help improve levels of activity:

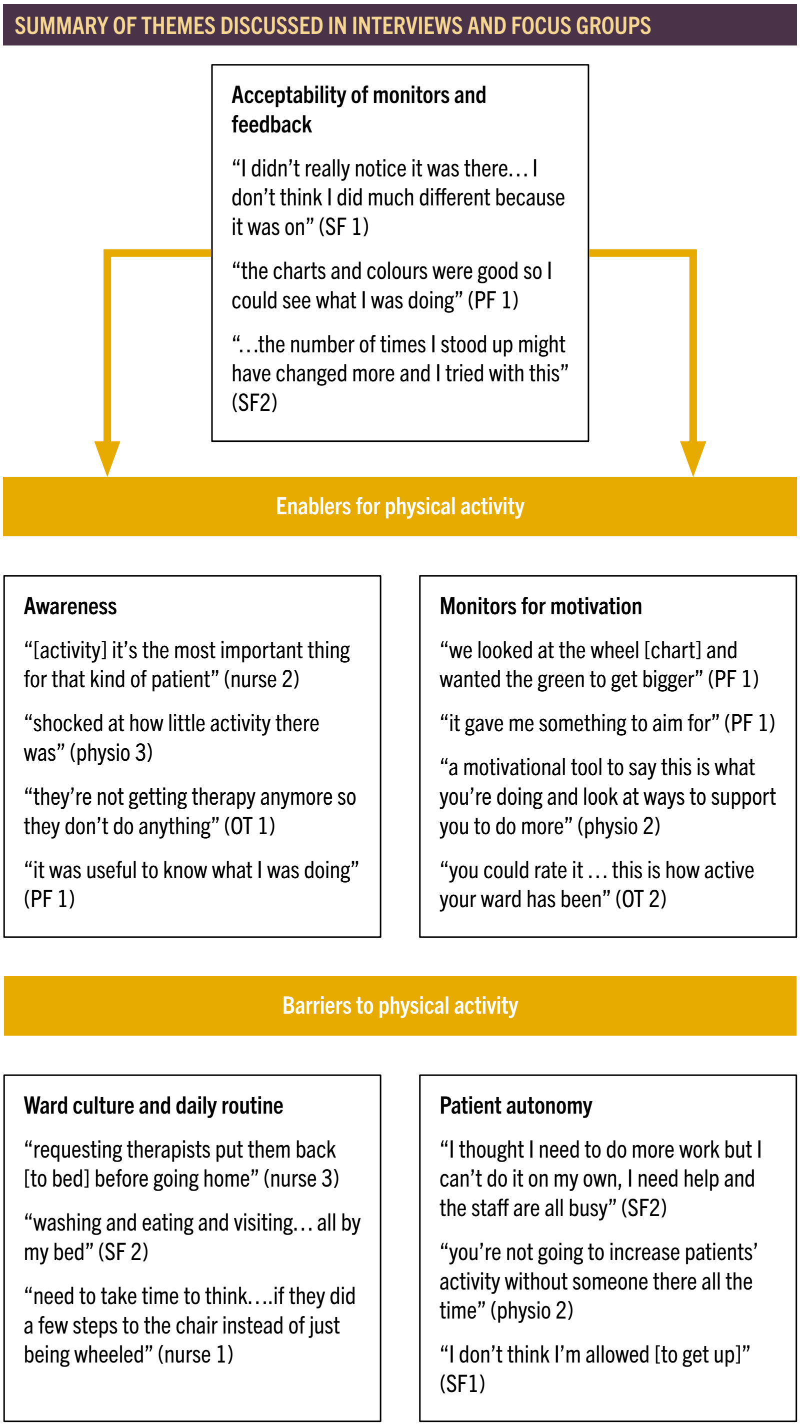
> *"It's the … ethos of rehab, having rehab in your mind that's why these patients are here not just let's just do this as quick as we can …" (Physiotherapist 1)*

Patient autonomy

Staff and patients acknowledged the impact of mobility impairment on physical activity. Patients were reluctant to ask for help and felt unable to be proactive with their activity. Staff were aware of the need to enable patients' activity, even when not dependent. It is not only the help a patient requires, but also that they do not feel "allowed" to move on their own. Patients and staff expressed that therapists should take the lead in promoting activity but that all MDT staff should be responsible:

> *"We depend on therapists to tell us about their mobility side by side with therapists and nurses; then the patients can act on it as well so we can do our part." (Nurse 1)*

Participants consistently expressed a need for teamwork involving the patient to help to improve physical activity across the stroke unit.



SUMMARY OF THEMES DISCUSSED IN INTERVIEWS AND FOCUS GROUPS

Acceptability of monitors and feedback

"I didn't really notice it was there… I don't think I did much different because it was on" (SF 1)

"the charts and colours were good so I could see what I was doing" (PF 1)

"…the number of times I stood up might have changed more and I tried with this" (SF2)

Enablers for physical activity

Awareness

"[activity] it's the most important thing for that kind of patient" (nurse 2)

"shocked at how little activity there was" (physio 3)

"they're not getting therapy anymore so they don't do anything" (OT 1)

"it was useful to know what I was doing" (PF 1)

Monitors for motivation

"we looked at the wheel [chart] and wanted the green to get bigger" (PF 1)

"it gave me something to aim for" (PF 1)

"a motivational tool to say this is what you're doing and look at ways to support you to do more" (physio 2)

"you could rate it … this is how active your ward has been" (OT 2)

Barriers to physical activity

Ward culture and daily routine

"requesting therapists put them back [to bed] before going home" (nurse 3)

"washing and eating and visiting… all by my bed" (SF 2)

"need to take time to think….if they did a few steps to the chair instead of just being wheeled" (nurse 1)

Patient autonomy

"I thought I need to do more work but I can't do it on my own, I need help and the staff are all busy" (SF2)

"you're not going to increase patients' activity without someone there all the time" (physio 2)

"I don't think I'm allowed [to get up]" (SF1)

Figure 4

DISCUSSION

This study provides practical information regarding the feasibility of providing activity feedback as an intervention using activity monitors. It adds to the research confirming low activity of patients in hospital after stroke, and considers the impact of who should be aware of physical activity and responsible for helping to increase it. There were insufficient numbers within this study to comment on the effects of the feedback, but feasibility and acceptability were demonstrated, and staff and patients reported potential for monitoring feedback as an intervention to improve physical activity after stroke.

The main aim was to determine the feasibility of using ActivPAL^{TM} monitors, and to promote physical activity through feedback of data. Critical to this was the small number of participants recruited. Despite wide eligibility criteria, only 14 of 142 (9.8%) patients screened over nine weeks were eligible. Amendment of the initial exclusion of participants with a MoCA score below 20 enabled inclusion of nine participants (MoCA score 6-19) – all able to use the activity feedback.

Forty-eight patients (33.6%) were excluded from the study due to communication or cognitive impairment and an inability to respond to the feedback. The format of data feedback was dictated by the ActivPal™ software; further consideration of feedback format could assist with accessibility of this intervention. Monitor feedback was reported as easy to understand but participants focused on the number of stands or steps rather than percentage time standing which may be a clearer measure in future study. Current literature focuses on use of monitors with mobile patients (Dorsch *et al* 2015, Mansfield *et al* 2015, Kanai *et al* 2017, Masashi *et al* 2018) – this study has demonstrated feasibility of activity feedback in those able to stand following stroke. This is promising as it is this group who may particularly benefit from increased practise of physical activity (Askim *et al* 2013).

The importance of an MDT approach, particularly with nursing involvement is important, where a consistent awareness of the level and importance of physical activity is shown in the ward environment.

Previously reported low adherence to monitor wear (Lynch 2018) was not problematic in this study. Seven-day monitoring was based on monitor validity data suggesting 7–14 days monitoring to ensure representative data (Edwardson *et al* 2015). For some participants, early recruitment may have affected their ability to influence activity due to immobility. Staff involvement in activity feedback is arguably more influential at this early stage of stroke recovery, and patients may become more engaged as their physical abilities improve. There was one withdrawal from the study due to the participant having numerous rehabilitation interventions. The intervention required daily engagement in considering the feedback data and how to respond to it. There may need to be consideration of the degree to which this intervention increases the amount of information a patient is required to take on. Larger studies may provide further information regarding the extent to which patients are able to engage with this as an intervention as part of their rehabilitation.

Physical activity was low at baseline and throughout activity monitoring, as has been repeatedly reported in the literature (West and Bernhardt 2012, Skarin *et al* 2013, Åstrand *et al* 2016). Less mobile participants commented on the need for assistance to increase activity and that they did not feel allowed to mobilise. The hospital environment provides limited opportunities for physical activity in the ward environment and patients describe a need for permission to move around in an unfamiliar setting (Kerr *et al* 2016, Rosbergen *et al* 2017, Koenders *et al* 2018). Kanai *et al* (2017) reported improved self-efficacy where patients were more involved in attempts to increase activity. The patient feedback participant in this study engaged both individually and with family in using feedback to increase activity, as highlighted in studies of patient experience of activity following stroke (Horne *et al* 2015, Prout *et al* 2017).

An MDT approach, particularly with nursing involvement is important, where a consistent awareness of the level and importance of physical activity is shown in the ward environment (King *et al* 2011, van de Port *et al* 2012, Barrett *et al* 2018). This study looks specifically at the difference between giving feedback directly to the patient compared to staff. Implementation of the staff feedback intervention was challenging and better understanding is required regarding the balance of responsibility for physical activity and how to embed this into routine practice. Participant interviews and staff focus groups acknowledged the need to embed activity into daily routine. A common barrier to activity is the set up of ward routine and culture (Prout *et al* 2016, Koenders *et al* 2018). The primary issue in the feasibility of delivering of the trial was the challenge to implement the staff feedback intervention. This study ran over nine weeks with ten patients. Over a longer time period there may be potential for staff to become more familiar with the monitors and feedback required. Introduction of new interventions requires significant preparation prior to implementation (Kilbourne *et al* 2007). This feasibility study has identified the need to establish improved methods to ensure staff are enabled to support patients with activity feedback.

All participants (patients and staff) thought monitors could be a useful tool for increasing physical activity following stroke. Staff focus groups highlighted the potential to give patients targets for the level of activity achieved. This contradicts findings of Kanai *et al* (2017) who demonstrated the importance of patient involvement in setting activity goals. In future research, a more structured approach to activity feedback with clearly discussed aims may provide an improved intervention to increase activity.

Limitations

This was a single site study with qualitative and quantitative data collected by the main researcher. This gives potential for bias as, in addition, there was no blinding of which groups the participants were allocated to.

The small number recruited to the study highlights the challenges of recruiting to rehabilitation trials in the acute setting. A high proportion of potential participants were excluded due to imminent discharge or inability to stand. In future study, MoCA score is not a relevant measure to determine potential to understand activity feedback and alternative criteria should be explored.

A limitation of the monitors is their inability to differentiate between lying and sitting, and therefore record changes in tolerance to sitting out of bed, a potentially important indicator in less mobile patients. An additional challenge in the clinical environment is the time taken for data download resulting in a delay in provision of feeback. A monitor set-up enabling simple and real-time feedback would enable staff and patients gain the most benefit from using monitors to improve physical activity.

Baseline activity data was collected over only one day and there was no consideration of whether therapy sessions had taken place. There is therefore likelihood that activity data would be influenced by other factors such as day of the week and duration of therapy sessions. The monitors were used for seven days as soon as the participant met the inclusion criteria. Measuring of activity throughout admission may have given greater opportunity for participants to respond to the activity feedback if their mobility was improving during their admission. Future studies should consider both timing and duration of activity monitor wear to make best use of activity feedback.

This feasibility study has provided information to progress further research into how activity monitor feedback can be used to promote physical activity. Activity feedback could provide a mechanism to improve awareness and motivation for physical activity of patients in hospital following stroke. Participants responded well to individualised feedback and consideration of how best to enable staff to support this will be key to any feedback intervention. Both staff and participants acknowledged the importance of physical activity in early recovery from stroke; the challenge is how to embed a team approach and ward culture to ensure this acknowledgement is acted upon in clinical practice and daily routine.

KEY MESSAGES

- Activity monitors can be used to provide activity feedback for patients with sufficient cognition and communication who are able to stand following stroke.
- Patients and staff acknowledge the importance of physical activity but need support to implement it in daily routine.
- Activity feedback may prove a useful intervention but requires better understanding of how best to deliver this.

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> *… staff and participants acknowledged the importance of physical activity in early recovery from stroke; the challenge is how to embed a team approach and ward culture to ensure this acknowledgement is acted upon in clinical practice and daily routine.*

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Declaration of interests

There are no interests to declare.

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APPENDIX 1

SCHEDULES FOR SEMI-STRUCTURED INTERVIEWS AND FOCUS GROUPS

PARTICIPANT INTERVIEW TOPIC GUIDE

- Introduction of self and reasons for interview
- Inform participant of length of interview and that it will be recorded and reasons for this.
- Inform participant of right to withdraw. Confidentiality and use of data
- Opportunity for questions

1 WEARING THE MONITOR

- How comfortable was the monitor? Were you aware of the monitor when you were wearing it?
- How long did you wear the monitor for?
- How easy or difficult was it to put the monitor on and take it off?
- Were there any problems with wearing the monitor? What were they?

2. ACTIVITY WHILST WEARING THE MONITOR

- How did wearing the monitor affect your activity whilst on the ward?

3. FEEDBACK FROM THE MONITOR

- How did you receive feedback from the monitor?
- What information did you get from the feedback?
- Was there any other information you would have liked to receive?
- What was good about this information?
- What was not so good?
- How clear was the information provided?
- How often would you like the feedback to be given?
- Pt. group: how often did you refer to the information provided?
- Staff group: how often was the information discussed with you?
- Is there anything you would change about the feedback given?

4. PEOPLE INVOLVED IN DISCUSSING THE INFORMATION

- Who else did you discuss the feedback information with?
- How often did you discuss this information?
- Was there anybody else that it would have been useful to discuss the information with?

5. OWNERSHIP OF THE DATA

- Who do you think should look after the feedback from the monitor?
- How did you change your activity as a result of the feedback?
- How easy was it to access the feedback information?

6. ONGOING USE OF THE MONITOR AS A TOOL

- How useful did you find the monitor as a tool to give you feedback about activity?
- What could be changed about using the activity monitor?
- What could be changed about providing the feedback?

Do you have any other comments or suggestions regarding the use of the monitor or activity feedback

STAFF FOCUS GROUP QUESTIONS

- Introduction of self and reasons for focus group
- Inform participants of length of group, that it will be audio recorded.
- Inform participants of right to withdraw.
- Confidentiality and use of data
- Opportunity for questions

1 USE OF THE MONITOR

- What did you think about looking after a patient wearing a monitor?
- How did it affect the care they received?
- What were the challenges with the use of the monitor?
- What (if anything) did you do differently as a result of the patient wearing a monitor?

2 MONITOR FEEDBACK

- Was the information from the monitor easy to understand?
- Was the information useful?
- Was there any other information you would want to see?
- Who else did you discuss the information with?
- Did you change anything as a result of the feedback?

3 OWNERSHIP OF THE FEEDBACK

- Who do you think should look after the printed feedback?
- Do you think anybody else should see the data?
- Who do you think should share the data with the patient?
- How often did you discuss the data with patients in the patient owned data group?
- How often did you discuss the data with patients in the staff owned data group?

4 ONGOING USE OF THE MONITORS

- How useful would the monitors be in daily clinical work?
- Are there any changes you would make in their use?

Do you have any other comments or suggestions regarding the use of monitors and feedback on the stroke unit?

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Abstracts

How is risk conceptualised in stroke rehabilitation?

Shae Jackson[1,2], Dorit Kunkel[1], Sara Demain[1]

Introduction

Post-stroke many people feel unprepared to get on with their lives following discharge from stroke services. Rehabilitation is typically delivered within a risk reduction framework of preventing injury and adverse events. It is not known how risk is conceptualised in the stroke literature, and how and to what extent biopsychosocial factors such as identity, choice, and the things that give one's life meaning are considered.

Method

A literature search (including Embase, Pubmed, CINHAL, PsychInfo and relevant grey literature) supported development of a narrative literature synthesis, including qualitative, quantitative and mixed-methods studies in adults >18 years. Categories were generated a priori to facilitate description of how risk is conceptualised in the stroke literature.

Results

Risk in stroke rehabilitation is predominantly conceptualised according to a medicalised model relating to physical risks such as: falls; risk of further stoke; and lifestyle factors, along with depression risk and fatigue. Few papers considered the unintended consequences of risk management in relation to what gives meaning to people's lives post-stroke, and there is little information on barriers and facilitators to safely resuming previously valued activities. The voice of people post-stroke is largely absent.

Conclusions

Risk is predominantly conceptualised according to the medical model with little consideration given to impacts on a person's identity and ability to make choices that give their lives meaning. Further qualitative research is needed to understand the perspectives and experiences of people post-stroke, caregivers, and health professionals in terms of how risk and risk-management are conceptualised and operationalised during stroke rehabilitation, informing co-design of services.

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Goal-directed and person-centred rehabilitation for spasticity

(Direct-Rehab)

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Introduction

Many people have difficulty controlling muscles following stroke and brain injury. Some are also left with muscle tightness or 'spasticity'. The aim of this project is the development of Direct-Rehab, a clinical decision-making algorithm and corresponding patient centred, treatment selection tool.

Method

We will categorise goals from secondary analysis of three existing data sets, followed by Delphi consultation with expert-clinicians, patients and carers to develop the Direct-Rehab algorithm and physical treatment selection tool. The Direct-Rehab implementation tool will then be developed and define core aspects allowing application of Direct-Rehab in different clinical settings.

Results

We have previously identified six participant-selected goal areas in two principal domains, which were mapped on to the WHO International Classification of disability Functioning and Health (WHO-ICF), from 1,623 goals in five published studies. Discussions have also been held with four focus groups following two workshops on management of spasticity and contracture. Views have been obtained on the preliminary Direct-Rehab model with resultant refinements. The structure in linking goals to treatment interventions has been strengthened and clearer linkage to assessment information from standardised measures incorporated into the Direct-Rehab algorithm.

Discussion

The Direct-Rehab algorithm, once fully developed, will provide a framework for planning physical rehabilitation interventions of relevance for those with spasticity. The complexity of rehabilitation in stroke and other brain injury is well known. Direct-Rehab provides a framework to address some aspects of this complexity for rehabilitation of people with spasticity.

Conclusion

The Direct-Rehab model will provide an ongoing framework for future research.

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Improved ability to achieve single leg stance increases gait efficiency following single leg stance intervention in adults post acquired brain injury

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Introduction

Acquired brain injury (ABI) population demonstrates reduced single leg stance (SLS) which correlates with reduced gait speed; rated the most negative impairment by ABI survivors. Studies of predominantly small samples demonstrate SLS intervention (SLSI) can improve SLS and gait speed post cerebrovascular accident (CVA) and to a lesser extent traumatic brain injury (TBI) resulting in a research gap for the whole ABI population.

Objective

To determine if an improved ability to achieve SLS leads to a more efficient gait pattern following SLSI in adults with ABI.

Method

A pilot pre-test–post-test experimental design utilising a control group (CG) with ABI adults from an inpatient neurorehabilitation unit (INRU). The experimental group (EG) received an individualised physiotherapy treatment programme (IPTP) alongside SLSI whilst the CG received IPTP only. Treatment was carried out a maximum of 45 minutes, four times/week for six weeks and based on neuro-developmental technique (NDT). SLS was measured using goal attainment scale (GAS) based on SLS test (SLST) and gait efficiency using 10m walk test (10MWT).

Results

Twenty-six participants were recruited and randomly allocated to EG (n=13) and CG (n=13). 92% of participants in EG achieved greater than GAS minimal clinical important difference (MCID) of ten compared to 31% in CG (p=0.002 and p=0.025 respectively). 77% of EG achieved greater than 10MWT MCID of 0.14m/s compared to 38% in CG (p=0.001 and p=0.033 respectively). All results were statistically significant with a p-value of 0.05 indicating group differences were due to SLSI.

Conclusion

SLSI with IPTP improved SLS (measured by GAS utilising SLST) and gait speed (measured by 10MWT) greater than IPTP alone in ABI survivors indicating SLSI in conjunction with IPTP could aid SLS and gait post ABI. Future research with larger samples and matched groups would enable generalisation to the whole ABI population.

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The impact of facial exercises in people with Parkinson's disease presented with hypomimia

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Inroduction

Parkinson's disease is a neurogenerative disorder that impacts dopamine production in substantia nigra. As a result of dopamine deficiency, people with Parkinson's diease (PWPD) are often diagnosed by clinical features that are both motor and non-motor signs. This impacts the person's movement patterns, autonomic functions, sleep, and facial expressions. Hypomimia is one of the signs of Parkinson's disease in which the person is presented with facial masking.

Objective

This research aimed to explore the impact of ten video-guided daily facial exercises for six weeks in people with Parkinson's who are presented with hypomimia.

Method

This qualitative study adopted a case-series approach through video-recording analysis followed by semi-structured interviews to measure facial expression pre- and post-exercise programme and gain an understanding of participants' experience of the programme. Eight PWPD with reduced facial expressions volunteered to undergo the exercise programme and to be interviewed. During the six weeks of exercise programme they attended weekly exercise classes to ensure compliance but also to re-learn the exercises. Data collection two was held after six weeks followed by a semi-structured interview.

Results

The results showed that the ten daily exercises can induce increased spontaneous and posed facial expression in people with Parkinson's who are presented with hypomimia comparing video-recordings from data collection one to data collection two. Seven participants showed improvement in spontaneous facial expression by portraying increased mouth and forehead movement. Participants also showed improvements in posed facial expressions. Seven participants showed improvements in angry expression followed by six in disgust, five in fear and happy, surprised, and four in sad facial expression. The results were also in line with participants' experience of the programme. Participants have reported that they had a positive experience and have noticed a change in their facial expression specially in smiling.

Neurological rehabilitation post COVID-19

A service evaluation to explore rehabilitation outcomes for patients with neurological complications of COVID-19

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Introduction

COVID-19 has led to an increasing number of the population requiring rehabilitation. Rehabilitation, progress and outcomes remain uncertain. A service evaluation was undertaken to explore rehabilitation outcomes for patients with neurological complications of COVID-19 admitted to a Specialist Neurorehabilitation Unit (SNRU).

Method

Patients with COVID-19 related neurological complications were admitted to the SNRU over a three-month period in 'wave 1' of the pandemic. Subjects' demographics, pathology, length of stay (LoS) and discharge destination were documented. Specific therapy outcomes (Chelsea Critical Care Physical Assessment Tool, Barthel Index, Functional Independence Measure, Quality of Life Assessments (EQ5D), as well as the cost of care per patient per week, were recorded on admission and discharge. Patients received multidisciplinary neurological rehabilitation and received an average of 9.4 therapy sessions per week.

Results

Ten patients were admitted with full data available for eight. A range of neurological complications were seen, most common being critical illness polyneuropathy/myopathy (60%) and cerebral infarct (30%). Other diagnoses included cerebral haemorrhage, encephalopathy and hypoxic brain injury. Dual diagnosis was recorded in 30%.

Mean age was 51.6 years, with an even distribution of males and females and 40% of patients were of black, Asian, and minority ethnic origin. Mean LoS was 40.55 days, a shorter stay was seen with critical illness neuropathy/myopathy compared with cerebral infarct. All patients demonstrated improvements in rehabilitation outcomes, with the mean for each being greater than the minimal clinical important difference (MCID). The average cost of care reduced from £1,154 to £159 per week. All eight patients were discharged home.

Conclusion

Patients made functional improvements in all areas with a marked reduction in care costs noted between admission and discharge. This suggests specialist inpatient rehabilitation is successful and increases independence in this patient group. Further research would enable evaluation of long-term recovery and reintegration into community and employment.

Rehabilitation using virtual gaming for hospital and home-based upper limb exercise post stroke (RHOMBUS II)

A feasibility randomised controlled trial

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Introduction

Many stroke survivors have ongoing problems using their hand and arm post-stroke. Effective upper limb (UL) rehabilitation involves practise and repetition. For the stroke survivor this may be tedious, while for the clinician, providing the required intensity can be challenging. Opportunities for the stroke survivor to engage with UL rehabilitation in a safe, accessible and engaging way are essential to improving UL outcomes following stroke. The NeuroPlatform is a non-immersive virtual reality digital platform designed specifically for UL rehabilitation post-stroke, consisting of a hand controller (NeuroBall), tablet, an app and nine specially designed games.

Objective

The aim of Rhombus II is to determine the safety, feasibility and acceptability of the NeuroBall as a rehabilitation intervention for retraining the UL in sub-acute stroke.

Method

A feasibility randomised controlled trial will compare the NeuroBall plus usual care with usual care to support UL rehabilitation over seven weeks. Participants will be in the early sub-acute post-stroke phase and on the inpatient and/or Early Supported Discharge (ESD) stroke pathway. Twenty-four participants will be recruited, with sixteen randomised to the intervention group and eight to the control group. Participants in the intervention group will be trained to safely use the device by a research therapist. Outcomes to be assessed at baseline and at seven weeks include: gross level of disability; objective and self-reported arm function; passive range of movement; spasticity; pain; fatigue; participation and quality of life. A parallel process evaluation will assess feasibility and acceptability of the intervention. Fidelity to the intervention will be measured objectively using data gathered via the platform. Post-intervention, semi-structured interviews with 12 of the sixteen participants from the intervention group, four from the usual care group and up to nine clinicians working on the stroke unit or within ESD will help determine the acceptability of the intervention.

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Changes to practice following a service evaluation of the intensity of independent exercise on a level-2 neurorehabilitation unit

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Introduction

Daniels Rehabilitation Unit (DRU) provides inpatient rehabilitation for patients with neurological conditions, including stroke. It is well known that intensive rehabilitation can improve functional outcomes in this patient population. However, a service evaluation identified that patients continue to spend large portions of their day being inactive.

Objective

To implement changes on DRU to increase the intensity of exercise completed by inpatients, out of designated therapy sessions

Method

An evaluation of current processes was completed. One of the main findings highlighted lack of activity at weekends compared with weekdays. To increase patient motivation and self-efficacy (factors shown in the literature to have a positive effect on exercise adherence), individualised exercise programme (IEP) folders were introduced. The aims of these folders were to keep IEPs organised and easy to find, and provide a sense of patient ownership. Patient and MDT staff questionnaires were sent out to gather both quantitative and qualitative feedback on the use of the folders. Feedback highlighted that both patients and staff found the folders useful; however, there was limited effect on increasing independent exercise. While 83% staff and 75% patients agreed that the folders made it easier for the IEPs to be located, only 33% staff felt they increased exercise frequency. As a result, further service changes were introduced including IEP reminders on daily plans and a new IEP group incorporating the folders, following which MDT staff questionnaires were repeated.

Results

Following further changes, 67% MDT staff felt that the folders significantly increased exercise frequency in patients. However, there continues to be ongoing barriers and facilitators to increasing independent exercise activity on DRU.

Conclusion

Building self-efficacy on an inpatient unit is challenging. Patients continue to rely on external prompts and motivators to prioritise independent exercise to facilitate their recovery.

A repeat service evaluation is planned.

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Stratified management of hemiplegic shoulder pain

Evaluation of evidence to update an established integrated care pathway

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Introduction

Hemiplegic shoulder pain (HSP) is a common complication of acquired brain injury with prevalence at one year of 39% (1). The integrated care pathway (ICP) for HSP has been established as providing a useful tool for managing pain in this complex condition (2). This review of the current evidence alongside expert opinion aims to update and optimise the clinical pathway.

Method

Three stages to the review of the clinical pathway:

1. Analysis of impact of the ICP on management of HSP
2. Review of evidence base since development of ICP
    - Literature search 2000–current day including CINAHL, PubMed, MEDLINE, Web of Science & Cochrane library databases
    - Analysis of systematic reviews using AMSTAR2, RCTs using PEDro and other study designs using CASP
3. Consultation process with MDT of expert clinicians
    - MDT focus groups to gain expert opinion using current evidence to review clinical reasoning pathway
    - Iterative trial and review of developments to ICP
    - Further focus group discussion and agreement of final update of ICP

Results

In a single-centre cohort (n=333) the ICP led to pain reduction in 65% of patients, with complete resolution in 21–41%. This compares favourably to the literature (14–27%). Literature review n=59: Systematic reviews=23, RCTs=13, Cohort/longitudinal studies=21, Qualitative=2. Focus group=6 (PT=2, OT=2, Medics=2) with average length of practice>30 years. Revised pathway established.

Conclusion

The need for differential diagnosis and specific management of HSP is clear and is fundamental to this pathway. It is timely that shoulder pain should no longer be treated as an 'umbrella' diagnosis in people who have neurology. This review of the evidence base in association with current best practice and expert opinion has updated and extended the established pathway. It will benefit from further multi-centre review.

References

1 Anwer *et al* 2020
2 Walsh *et al* 2021

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Comorbid stroke and cardiac rehabilitation

What factors influence completion?

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Introduction

After a stroke, it is important to address risk factors, such as physical activity and exercise, as part of rehabilitation and for secondary prevention. Exercise is recommended in guidelines but challenging to implement in practice. Cardiac rehabilitation (CR) is a multi-faceted intervention which routinely includes exercise. It is increasingly being offered to patients with additional comorbidities, including stroke, and may provide data that could help inform future rehabilitation delivery. This study aimed to identify what factors influence completion of cardiac rehabilitation by these patients.

Method

Data collected routinely for the National Audit of Cardiac Rehabilitation (NACR) between 2013 and 2019 were used for this retrospective observational study. Bivariate analysis alongside backwards regression models were used to identify patient- and service-level factors associated with completion of CR by people with comorbid stroke.

Results

11,097 patients with comorbid stroke were included in the study, of whom 71% completed CR. Nine significant patient- and service-level factors associated with completion were identified. Being older, partnered and resident in less deprived areas, and the relative proportion of people with stroke in the CR service were positively associated with completion. Conversely, having a previous cardiac event, additional comorbidities in the psychosocial or metabolic categories meant the overall number of people in the service were associated with a lesser likelihood of completion.

Conclusion

This is the first study to use a large national dataset to investigate patient- and service-level factors associated with completion of CR by patients with comorbid stroke. Knowledge of these factors can help clinicians to focus efforts on those patients less likely to complete CR and address challenges within service redesign.

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A case study demonstrating the effect of neurorehabilitation for mononeuritis multiplex post COVID-19

Improving function, quality of life and preventing the need for surgery.

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Introduction

COVID-19 has led to an increasing burden of disease and disability, highlighting the importance of an acute rehabilitation pathway to meet these complex needs (BSRM 2020). Mononeuritis multiplex has proven to be a prevalent consequence of severe COVID-19 and the underlying etiology of these neuropathies remains to be established (Needham *et al* 2021). In severe cases of neuropathy, nerve decompression and nerve transfers are considered (Grinsell and Keating 2014). However, the associated risks of undergoing surgery with significant pulmonary compromise post COVID-19 require careful consideration.

Patient background

Patient contracted COVID-19 in March 2020 and developed severe respiratory complications requiring a 40-day period on ECMO; complications were extensive, including development of mononeuritis multiplex. Subsequently referrals to the peripheral nerve injury unit and neurorehabilitation were made.

Intervention

Twelve-week admission to a neuro-rehabilitation unit. Intervention comprised 45 minutes of physiotherapy and occupational therapy sessions five times weekly, supplemented by group sessions. Additional adjuncts included; splinting, orthotics, FES and exercise prescription.

Outcome

A reduction in care needs from being fully dependent with support from two carers to discharge home with supervision from family and no package of care. Significant improvements in balance and strength, resulting in patient mobilising independently with bilateral orthotics indoors.

In light of the significant changes, while weighing this against the risks of surgery in a patient with respiratory compromise the decision was made not to undertake explorative surgery and potential nerve transfer but to continue rehabilitation and review at a later date.

Conclusion

Twelve weeks of neurorehabilitation resulted in significant gains in strength, balance and function, resulting in significantly decreased care needs and improved quality of life. These changes ensured that a peripheral nerve transfer was no longer required, which would have posed significant risks due to the patients' compromised respiratory function as a consequence of COVID-19.

Development of a training toolkit by a neuro-outreach therapy team in response to neurological presentations in COVID-19 patients

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Introduction

COVID-19 has been associated with the development of a variety of neurological presentations including stroke, encephalopathy, Guillain-Barré Syndrome, peripheral neuropathies, delirium (Russell *et al* 2021) and cognitive changes (Ellul *et al* 2020), many of which require ongoing rehabilitation. In COVID-19 patients, the need for early assessment of onward rehabilitation needs, including appropriate triage to specialist services, has been identified (Turner Stokes *et al* 2020). The neuro-outreach therapy team was in the perfect position to help support patients with COVID-19 presenting with new neurological impairments.

Objective

To develop a specialised toolkit, training and clinical support programme to aid non-neuro therapists working with COVID-19 patients on wards.

Method

After reviewing data collected during the first wave of the pandemic, a resources toolkit and training programme was developed. Education on neurological conditions associated with COVID-19, clinical joint sessions and telephone consultations were implemented.

Results

During the second wave of the pandemic, the neuro-outreach therapy service trained 40 non-neuro therapists. The feedback received was positive and increased confidence in the assessment, treatment and identification of neurological presentations.

After implantation of the training, referrals to the neuro-outreach therapy service, for COVID-19 patients with new onset neurological presentations increased from 10 (first wave) to 35 (second wave). Of these, 30 (85%) had a confirmed neurological diagnosis prior to discharge. More patients were signposted into neuro rehabilitation pathways including specialist inpatient neurorehabilitation (6 compared to 3), local stroke units (8 compared to 0) and community neurorehabilitation services (7 compared to 3).

Conclusion

The development of a specialised toolkit and training programme increased confidence in assessing and treating COVID-19 patients with new onset of neurological impairments in therapists with non-neuro backgrounds. It improved identification of neurological presentations in COVID-19 patients, assisted with early diagnosis, improved signposting and streamlined patients into neuro specific rehab services.

Brachial plexus neuropathies during the COVID-19 pandemic

A retrospective case study of a patient admitted to a specialist neurorehabilitation unit

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Introduction

Brachial plexus injuries are a potential complication of proning ventilated patients with COVID-19 pneumonitis. This case study outlines the presentation, rehabilitation, and outcomes of such a patient admitted to an intermediate neurorehabilitation unit (INRU).

Case description

Mr P, 51-years-old, was admitted to hospital with COVID-19 and an upper GI bleed. He was proned several times. He was transferred to the INRU with critical illness neuropathy. Nerve conduction studies showed severe bilateral upper limb (UL) motor and sensory abnormalities; likely secondary to brachial plexopathies. Mr P was previously independent but with chronic obesity, T2DM, and low mood.

UL problems on admission: reduced cutaneous sensation and proprioception, significant soft-tissue shortening and joint stiffness with reduced range of movement (ROM), shoulder subluxation, neuropathic and musculoskeletal pain, and flickers of distal muscle activity.

Management and outcome

Rehabilitation focused on increasing biomechanical ROM, incorporating active-assisted exercises, as nerve recovery evolved. Treatments included: desensitisation, soft tissue and joint mobilisations, and shoulder orthotics and positioning for prolonged stretch, including bespoke resting splints.

After four months, Mr P had achieved functional passive ROM in all UL joints. His shoulder activity was sufficient to reach, push doors open and press buttons. However, despite becoming independently mobile, he required assistance for most functional tasks, due to minimal activity in elbows, wrist and hands. Neuropathic pain reduced, but musculoskeletal pain persisted during passive interventions.

Other potentially beneficial treatments could not be explored on the INRU, such as electrical stimulation and hydrotherapy.

Discussion

Peripheral nerve injuries due to proning may complicate rehabilitation progress and outcomes. Physiotherapists may play a key part in optimising positioning of patients during proning, identifying peripheral nerve injuries early, providing rehabilitation interventions, and referring to specialist services.

Mr P's case highlights this need. Further exploration of other services and evidence-based interventions may assist to enhance long-term recovery.

Brachial plexus neuropathies during the COVID-19 pandemic

Incidence and presentation of patients admitted to a Specialist Neurorehabilitation Unit

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Introduction

The use of prone positioning to treat patients on critical care who are mechanically ventilated is well accepted and has been frequently utilised in the management of COVID-19 pneumonia. During the pandemic there has been an increase in the number of patients requiring rehabilitation, including those with neurological impairments post COVID-19, with brachial plexus lesions being a common complication in the proned patient. A service evaluation was conducted to report on the incidence and presentation of brachial plexus neuropathy in post COVID-19 patients admitted to a specialist neurorehabilitation unit (SNRU).

Method

Patients admitted to the SNRU with neurological complications following COVID-19 were assessed and those with suspected peripheral nerve injuries following proning in critical care identified. Rehabilitation outcomes (Functional Independence Measure, Barthel, ARMA, ROM and pain) were collated for each patient and all received inpatient multidisciplinary neurorehabilitation.

Results

23 patients with neurological complications post COVID-19 were admitted to the SNRU with four (17%) identified as having brachial plexus neuropathy. Bilateral lesions were seen in two patients. Impairments included neuropathic and musculoskeletal pain, reduced active and passive ROM, sensory deficits and muscle wasting.

Following rehabilitation, improvements were noted in all patients in pain scores, proximal ROM and power. However, there was limited improvement in functional outcomes given a lack of distal improvement.

Conclusion

Peripheral nerve injuries may be a complication of prone positioning with prevalence increasing due to COVID-19. Peripheral nerve damage can be slow to recover therefore physiotherapy intervention is essential in the acute phase to optimise prone positioning, and in the rehabilitation phase to optimise conditions for recovery through the management of pain, maintenance of range of movement and prevention of secondary complications such as biomechanical changes and contracture.

Exploring the impact of technology to enhance upper limb therapy on functional outcomes in adults following acquired brain injury

A clinical case study

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Introduction

More than half of people with upper limb (UL) impairment have problems months to years post stroke. Repetitive task practice and therapy intensity can influence neurological recovery. The NHS long-term plan highlights the need for higher intensity care models for rehabilitation, but this can be difficult to achieve with limited budgets and staffing.

This case study explores how technology may be a beneficial adjunct to complement existing UL neurorehabilitation provision and outcomes.

Case description

Mr J, 19 years old, was admitted to a specialist neurorehabilitation unit following a Cerebral Venous Sinus Thrombosis with venous ischaemia and haemorrhage. He presented with right sided hemiplegia, cognitive impairment and dysarthria.

Good therapy progress was made, and he was soon mobile. Functional independence, however, was compromised by his UL impairments, weakness, spasticity, and pain.

Management and outcomes

Mr J received UL management including therapy based on the neurodevelopmental approach, botulinum toxin injections, and orthotics provision for shoulder subluxation and pain.

A UL robotic device, Tyromotion Amadeo, was introduced and used for one hour at least four times weekly, in addition to usual therapy. Treatment was supervised by rehabilitation assistants and the patient's family, increasing intensity of the UL intervention. Impact was evaluated, using ARMA, power, spasticity, and pain scores.

Improvement in outcomes were noted. In the hand, flexor power increased from 1.9kg/force to 3.8kg/force, resting tone reduced from 0.15kg/force to 0.1kg/force and spasticity reduced from 2 to 1 on the Modified Ashworth Scale. ARMA scores improved and UL pain was reduced.

The patient reported increased motivation through the biofeedback element of the Amadeo.

Conclusion

Technology could be an effective and efficient adjunct to existing UL neurorehabilitation to increase therapy intensity and improve patient motivation. This case study demonstrates improved outcomes by increasing UL intensity through the introduction of assistive technologies rather than increasing staffing.

Accelerometers-embedded lycra sleeves to test wear compliance and upper limb activity in people with stroke

A feasibility study

Praveen Kumar[1], Jason Leake[2], Shannon Brodie[1], Jennifer Molton[1], Rosie O'Reilly[1], Alex Pearce[1], Jade Steele[1], Praminda Caleb-Solly[3]

Introduction

Of the 80% of people with stroke who lose upper-limb function, only 12% make a full recovery. A lycra sleeve provides a compressive effect to the affected arm and may improve glenohumeral subluxation and arm function. To establish a possible effect of lycra sleeves, accurate recording of wear time is critical.

Objective

The aim of this study was to test whether an accelerometer-embedded lycra sleeve can measure wear compliance and record upper limb (UL) movements/activity in people with stroke.

Method

A convenience sample of seven adults with stroke resulting in unilateral UL weakness were approached. Participants wore an accelerometer-embedded lycra sleeve on their affected arm for eight to ten hours/day for 14 days and were prescribed four simple upper limb exercises. They completed a diary to record daily sleeve wear time and exercise times. Upper limb function, shoulder muscle strength, range of movement and pain were assessed at day 1 and 14.

Results

Five participants (72±10 years) were recruited. Mean time since stroke was 20 months. Using an acceleration movement threshold of 0.01g (g=acceleration of gravity) and the constructed algorithm, the sleeve donning and doffing time was identified. Mean accelerometer and diary recorded wear time were 11.64 hours/day (SD 2.64) and 11.27 hours/day (SD2.03) hours/day respectively. Individual spikes above threshold indicated UL activity but could not distinguish participant-recorded exercises from daily UL use. Arm function showed improvement in three out of five participants.

Conclusions

Accelerometers provide a practical method to record wear-time of a lycra sleeve, overcoming the necessity for patients to keep diaries, which can often be unreliable. A more sensitive accelerometer, which can detect the direction of the acceleration and movement should be considered in future study.

Clinical relevance

Accelerometers provide accurate data on lycra sleeve wear-time and may help with monitoring adherence.

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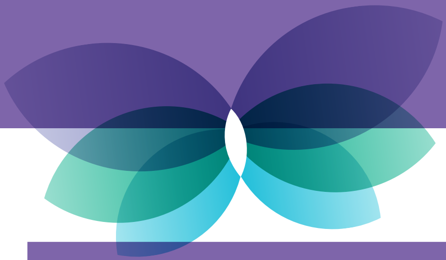

ORAL PRESENTATIONS

Physiotherapy administered Botulinum Toxin A and its role in promoting active functional recovery in sub-acute stroke

A case study

Rob Bateman
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Introduction

Spasticity has been reported in 27% of patients six weeks after stroke. It is associated with lower levels of function and independence alongside a four-fold increase in direct care costs in the first-year. Local intramuscular injection of Botulinum Toxin A (BoNT-A) is an established, well tolerated treatment for focal spasticity. Recent evidence suggests that the optimal time for this intervention is within three months post stroke. However, its role in promoting active functional recovery during this sub-acute phase remains under investigation.

Method

A single case design was used pre and post BoNT-A injection on an eight-week post pontine stroke patient receiving in-patient multidisciplinary rehabilitation. Multi-focal spasticity was identified utilising the Modified Tardieu scale primarily within flexor carpi radialis (FCR), pronator teres (PT) alongside gastrocnemius and soleus on the right side. Patient goals were set with the Goal attainment scale (GAS) Light format. BoNT-A (Dysport®) injections were administered via electromyography (EMG) by a physiotherapist under a patient specific directive.

Results

The Arm Activity Measure (ArmA) section B demonstrated 15-point reduction in difficulty from pre to two week post BoNT-A. A 9-hole peg test improved from 3 minutes 33 seconds to 1 minute 44 seconds at the same time points. There was a clinically meaningful improvement in gait speed using the 10-metre walk test of 0.18 m/s. Spasticity reduction was noted on the Modified Tardieu scale (angle of catch improvement was: FCR=35º, PT=15º, Gastrocnemius=10º and Soleus=10º). The three primary GAS-Light goals were also achieved scoring 'As expected'.

Conclusion

This single case study demonstrates that early BoNT-A intervention in a sub-acute stroke patient across both upper and lower limb is safe, effective and can produce short-term improvements across objective measures of spasticity, functional outcomes and goal attainment. Follow-up investigation is required to determine long-term efficacy.

A values based approach to goal setting in patients with severe acquired brain injury (ABI)

An audit and service evaluation

Luke Rendell, Alexandra Rose
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Introduction

Goal setting following ABI is vital in identifying priorities of admission, highlighting necessary interventions and evaluating progress. Goals should be appropriate, achievable and measurable, involve the patient and be meaningful to them. The complex presentations of patients following ABI can make effective patient-centred goal setting difficult to implement, leading to uni-professional goals that do not reflect individual patients' values or motivators, and are not easily accessible to patients/families. A values based goal-setting pathway was launched on a Level-1 neurorehabilitation and assessment service. This included a patient-centred-outcome (PCO) pathway for patients unable to participate in goal setting, such as those in prolonged disorders of consciousness (PDoC). The aim was to develop a more holistic goal-setting pathway that adhered to national guidelines, promoted interdisciplinary goal-focused rehabilitation, improved patient motivation, and created a more meaningful and personal rehabilitation experience.

Method

An audit of adherence to the pathway processes was completed six months post implementation and training provision. The audit was separated according to rehabilitation versus PDoC assessment to assess for any differences in process adherence. Simultaneously, qualitative surveys and structured interviews were completed with staff and service users to establish their views and experiences of the goal-setting process.

Results

Global improvement in adherence to goal-setting processes was seen; however, less adherence in PDoC patients' documentation was noted. Staff reported increased confidence in goal setting, but had ongoing difficulties in setting PCOs in PDoC. Increased evidence of goals and PCOs being patient centered and values based was noted. Service users provided positive feedback on this goal-setting pathway and found goals accessible and understandable.

Conclusion

Although further development of the PCO pathway is required, this values based approach appears to be meaningful to patients and families and an appropriate method of goal setting after severe ABI.

How do the rehabilitation needs of acute neuroscience patients compare to patients in specialist rehabilitation units?

A service evaluation and benchmarking exercise

Natalie Thrale[1,2], Adine Adonis[2]

Introduction

Neuroscience units provide highly specialist neurology and neurosurgical interventions for patients with complex medical needs. These patients also have complex rehabilitation needs; however, access to specialist rehabilitation units for intensive therapy is limited and waiting lists are long. Understanding how the rehabilitation needs of neuroscience patients compare with patients in specialist rehabilitation units is crucial. This information may provide evidence to support the development of neuroscience rehabilitation services able to meet the complex rehabilitation needs of patients whilst on an acute ward.

Objectives

To compare the rehabilitation needs of neuroscience patients with those of patients in specialist rehabilitation units using data from the UK Rehabilitation Outcomes Collaborative (UKROC).

Methods

A service evaluation was carried out by the therapy team of a UK neuroscience unit over one year. Rehabilitation needs were measured using the Rehabilitation Complexity Scale – Extended (RCS-E). Additional data including the prevalence of tracheostomies and modified Barthel Index scores were also collected. This data was benchmarked against UKROC data from specialist rehabilitation units.

Results

Of the 543 patients analysed, 203 (37.4%) had non-complex rehabilitation needs (RCS-E 0-10). For the remainder: 203 patients (37.4%) had highly complex rehabilitation needs (RCS-E 11-14), closely resembling patients in Level-2 specialist rehabilitation unit; 137 patients (25.2%) had very highly complex rehabilitation needs (RCS-E score 15-22), closely resembling patients in level 1a and hyper-acute specialist rehabilitation units.

Conclusions

The majority of neuroscience patients had specialist rehabilitation needs directly comparable with patients in specialist rehabilitation units. This raises questions of the level of therapy provision, and associated staffing requirements, of neuroscience units to meet the rehabilitation needs of patients. This benchmarking exercise provides initial evidence to support the potential application of the British Society Rehabilitation specialist neuro-rehabilitation services guidelines to this neuroscience unit to guide therapy staffing and rehabilitation provision for complex patients.

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Functional Electrical Stimulation (FES) for foot drop in neurological rehabilitation

A survey of physiotherapy practice

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Introduction

Functional Electrical Stimulation (FES) is widely researched and is considered an effective treatment option for neurological patients with foot drop. There is currently no published literature discussing the physiotherapy pattern of FES use within the UK. The aim of this study was to investigate UK physiotherapy clinicians' use, knowledge of evidence, training using FES for foot drop as well as referral and prescription criteria, and barriers and facilitators of use.

Method

An electronic survey was distributed to physiotherapists working throughout the UK. Descriptive analysis was used to report survey data. Ethical approval was gained for the study from the School of Health Sciences Research Review Group (SHS/18/13).

Results

217 responses from across the UK were included in the survey analysis. Most had worked with neurological patients for greater than ten years (65.4%) with a neurological cased load of ≥ 80% (77.9%). Nearly half of NHS staff (47.8%) had never or rarely used FES with the majority of private practitioners using it frequently or sometimes. Approximately half (53.6%) agreed there is strong scientific evidence supporting the use of FES in foot drop and many (62.2%) agreed they would like to increase their use of FES. A limited number (29%) reported having specific referral or prescription criteria for FES. Barriers to using FES included high costs and funding issues, access to equipment and lack of training, knowledge and experience.

Interpretation of results

There is insufficient use of FES for foot drop in the UK particularly within the NHS. Physiotherapists are keen to use FES more in patients with foot drop despite reduced awareness of the strength of evidence supporting its use. There is currently insufficient clear referral and prescription criteria available. Improved access to resources, education and funding may assist future implementation. Future research should focus on barriers to use.

A service evaluation of acute neurological patients managed on clinically inappropriate wards

Rich Holmes, Sophie Stratford
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Objective

Despite the benefits of early and frequent input from a neurologist, there is wide variation in the availability of this service, especially in district general hospitals, with many patients managed on clinically inappropriate wards. The purpose of this service evaluation was to explore the impact this had on patient care.

Method

A retrospective service evaluation was undertaken at a National Health Service hospital by reviewing patient records over a six-month period. Data related to demographics, processes within the patient's care, and secondary complications were recorded. Findings were compared with those of stroke patients managed on a specialist stroke ward.

Results

A total of 63 patients were identified, with a mean age of 72 years. The mean length of stay was 25.9 days, with a readmission rate of 16.7%. Only 15.9% of patients were reviewed by a neurologist. There was a high rate of secondary complications, with a number of patients experiencing falls (11.1%), pressure ulcers (14.3%), and health care-acquired infections (33.3%) during their admission.

Conclusion

The lack of specialist input from a neurologist and the management of patients on clinically inappropriate wards may have negatively impacted length of stay, readmission rates, and the frequency of secondary complications.

Is skull fracture associated with traumatic benign paroxysmal positional vertigo

An observational study

Abby Newdick[1], Bethany Hedges[1], Rebecca Smith[2,3], Lisa Fowler[4], Katherine Elliot[1]

Introduction

Dizziness in traumatic head injury (HI) is common. The most frequent cause of dizziness following HI is benign paroxysmal positional vertigo (BPPV) affecting 30–50% of patients. Long-term dizziness has a high physical, mental and socioeconomical burden. Improved acute screening of BPPV would ensure timely management of an individual's dizziness. We sought to understand whether skull fractures have an impact on the incidence of BPPV. We also aim to explore other possible risk factors.

Method

Patients were recruited from three major trauma centres. Inclusion criteria: closed head injury as defined by CT imaging, over 18 years, absence of cervical instability. Data was gathered prospectively: demographics, HI details (presence of skull fracture, severity, and mechanism of injury) and the presence of BPPV. The term 'skull fracture' includes facial and cranial fractures. Skull fractures were identified from CT and MRI imaging of the head. Bivariate analysis using the chi-squared test, and logistical regression was used to interpret the data.

Results

A total of 197 patients were included in this study. 16 patients were either unable to tolerate testing or discharged prior to assessment. 62 patients had BPPV and 119 showed no evidence of BPPV. 67% of patients with BPPV had a skull fracture. Chi- squared analysis shows there is a statistically significant relationship between presence of a skull fracture and BPPV ($p=0.00$). Following the adjustment for potential confounding variables (age, sex and mechanism of injury, severity of HI), only skull fracture and severity of HI were found to have an association with the presence of BPPV.

Conclusion

BPPV is significantly associated with the presence of a skull fracture and severity of HI. Clinicians should prioritise BPPV screening acutely in all patients classified as a Mayo A (severe HI) and those with skull fractures, inclusive of facial or cranial fractures.

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POSTER PRESENTATIONS

The experiences of professionals involved in co-produced health research projects

A qualitative systematic review

Jude Isaac[1,2], Karen Jones[1]

Introduction

The Chartered Society of Physiotherapy (CSP) highlights the importance of clinical research addressing the areas most meaningful to patients, carers and clinicians. One way of achieving this is by coproducing health research as a team of equal stakeholders. Limited research exists focusing on the experiences of professionals involved in such projects.

Objective

To explore the experiences of professionals involved in coproduced health research projects.

Method

Systematic review

- **Search strategy**: All relevant databases to identify qualitative research studies.
- **PRISMA**: 16,248 records were identified from databases. Following removal of duplicates and initial screening, seven studies were identified for analysis.
- **Assessment of methodological quality**: seven studies were critically appraised by two reviewers using the CASP critical appraisal tool, following which three further studies were excluded.
- **Data extraction/synthesis**: four articles underwent data extraction using the JBI QARI data extraction tool, and data was synthesised using a meta-aggregative approach.

Results

Three main findings were established: factors facilitating the success of coproduction, barriers to co-production, and positive outcomes of co-produced research.

Potential barriers included traditional research conventions, power struggles, and researchers' understanding of coproduction. Facilitators included shared decision-making, flexibility and acceptance of other approaches. Researchers felt that coproduction gave research more credibility, and took research into new and different directions. There was a feeling of responsibility for raising the profile of coproduction and influencing its use in future research.

Recommendations

Shared decision-making should be embodied throughout the whole research process to capitalise on the different skills and experiences of a research team.

The conventions of traditional research that can be a barrier to coproduction should be challenged and adapted where possible.

Quality coproduced research can be valuable in informing the direction of future health research, care, and services. Further clarification is needed regarding its definition and process in health research.

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A health promotion initiative aimed at increasing participation and sustainability of physical activity and exercise following acquired brain injury

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Introduction

Physical activity and exercise is widely supported for its benefits to both long-term physical and mental health. Longitudinal studies have shown that patients with acquired brain injuries are at an increased risk of developing sedentary behaviour and therefore secondary health complications, such as cardiovascular disease and depression. This is thought to be primarily as a result of reduced participation and sustained involvement in social and physical activities due to poor exercise self-efficacy.

Method

We developed a cardiovascular fitness group on our Level-1 brain injury rehabilitation unit with the aim of empowering patients to be more physically active and providing them with knowledge and tools to sustain these behaviours following discharge.

Our pilot programme consisted of a 40-minute circuit class, comprised of five six-minute stations aimed at strength and cardiovascular fitness. Patients completed a pre and post class outcome measure (6-minute walk test, timed 10m walk test) and base line HR values to enable training intensity to be calculated. During the class, patients heart rates were recorded at each station, alongside a perceived exertion score (BORG). Patients rated their satisfaction following each class, on a visual analogue scale.

Results

Following a six-week block of weekly classes, results showed 100% of patients walked with less support and 50% had an increased walking distance on their post class outcome measure and patient satisfaction was high. However, no patients consistently worked within a training intensity of 40–60% of HRmax and BORG measurements and demonstrated only mild to moderate levels of exertion.

Conclusion

This pilot demonstrated that running a cardiovascular fitness group for acquired brain injury patients was both feasible and beneficial. Future considerations include adapting the stations to meet differing patient capabilities, increasing class frequency from once a week, the introduction of an education component and implementing the use of an exercise self-efficacy measure.

The black box of multidisciplinary rehabilitation opened

Using the Northwick Park Therapy Dependency Assessment (NPTDA) to describe therapy intervention in a cohort of patients with complex brain injury in the UK

Stephen Ashford[1,2,3,4], Lynne Turner-Stokes[1,2], Rose Hilary[1], Barbara Singer[5]

Introduction

The Northwick Park Therapy Dependency Assessment (NPTDA) is a tool to record therapy intervention in patients undergoing rehabilitation. Ethical approval for use of routine data obtained.

Objectives

- To describe and quantify therapy input for patients undergoing specialist in-patient rehabilitation following complex brain injury in real-life clinical practice.
- To examine the relationship between therapy input and impairment severity, functional independence and rehabilitation complexity.

Method

A cohort analysis (2014–2019, n=286 patients) of prospectively collected data in a tertiary inpatient rehabilitation programme.

- Recorded at fortnightly intervals, the NPTDA was used to calculate the total delivered therapy hours/discipline and/task area; and also therapy intensity (mean hours/working day)
- Other measures: Neurological Impairment Scale(NIS), UK Functional Assessment Measure(UKFIM+FAM); Patient Categorisation Tool(PCAT); Rehabilitation Complexity Scale (RCS).

Results

Demographics

- Male/Female ratio:63:37%
- Mean age: 45.0 (sd13) years
- Mean length of stay:103 (SD49) days

Aetiology

- Stroke (63%)
- Trauma (20%)
- Hypoxia (7%)
- Other (10%).

Mean total hours

- Overall mean (95% CI) total therapy hours for the programme were: 414 (390, 440)
- Mean intensity 5.6 (5.5, 5.7) hours per day

Mean total hours per discipline

- Physiotherapy: 108 (104, 116)
- Occupational therapy: 110 (103, 117)
- SLT: 52 (48, 58)
- Psychology: 37 (33, 41)
- Social work: 33 (30, 35)

Mean hours/task area

- Physical management: 148 (138, 158)
- Basic function: 50 (45, 56)
- Activities of daily living: 32 (29, 34)
- Cognitive/psychosocial: 41 (37, 46)
- Discharge planning: 79 (73, 85)
- Additional activities: 65 (60, 69)

Entered stepwise in multiple regression analysis, the UKFIM+FAM, NIS, PCAT and RCS all contributed to the model, predicting 33.3% of variance in total therapy time. The FIM+FAM-cognitive scale and RCS predicted just 13% of variance in therapy intensity.

Conclusions

The NPTDA can provide useful information about therapy input, which cannot be gathered by proxy from other standard measures. Rehabilitation intervention, as captured by the NPTDA in a specialised inpatient service, is shown to be multi-dimensional/disciplinary in nature.

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Is focused therapy intervention as measured by the Northwick Park Therapy Dependency Assessment (NPTDA) significantly influenced by the presence of spasticity or contracture?

Stephen Ashford[1,2,3,4], Hilary Rose[1],
Barbara Singer[5], Lynne Turner-Stokes[1,2]

Introduction

The Northwick Park Therapy Dependency Assessment(NPTDA) records therapy intervention in patients undergoing rehabilitation. The NPTDA was used to identify treatment for spasticity or contracture. The presence/absence of spasticity or contracture were identified using the Neurological Impairment Set(NIS). Ethical approval for use of routine data was obtained.

Objectives

- To describe and quantify therapy input for patients undergoing in-patient rehabilitation who have spasticity or contracture.
- To examine the relationship between therapy time and the presence of contracture or spasticity, and differences in NPTDA scores in groups with or without these impairments.

Method

A cohort analysis (2012–2019, n=426) of prospectively collected data in a tertiary inpatient-rehabilitation programme.

- Recorded at fortnightly intervals, the NPTDA was used to calculate the total delivered therapy hours and/task area; and therapy intensity (mean hours/working day)

Results

Demographics

- Male/Female ratio: 63:37%
- Mean age: 44.0 (sd13) years
- Mean length of stay:103 (SD49) days

Aetiology

- Stroke (63%)
- Trauma (20%)
- Hypoxia (7%)
- Other (10%)

Mean total hours

- Overall mean (95%C) total therapy hours for the programme were: 414 (390, 440)
- Mean intensity 5.6(5.5, 5.7) hours per day

Mean targeted physical intervention (medical intervention eg Botulinum toxin injection, orthotics arm/leg, wheehchair seating/positioning and therapeutic practice/intervention) hours/week

- without contracture or spasticity: 64 (60, 68)
- with spasticity: 81 (75, 87)
- with contracture: 91 (83, 101)
- with contracture and spasticity: 97 (84, 111)

Significant differences were identified for total activity between no spasticity/contracture; spasticity (t=-4.68: p0.000) and contracture (t=-6.8: p0.000) and spasticity/contracture (t=-6.06: p0.000).

Conclusions

The NPTDA can provide useful information about the amount of therapy input specific to management of contracture and spasticity. It was possible in this analysis to quantify the differences in amount of therapy input when spasticity and contracture were present. These data show that the presence of spasticity or contracture correspond to an increase in therapy provision.

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How is risk conceptualised in stroke rehabilitation?

An inductive content analysis and critical narrative synthesis

Shae Jackson[1,2,3], Dorit Kunkel[2], Sara Demain[2]

Introduction

Many people feel unprepared to get on with their lives following discharge from stroke services. Rehabilitation is typically delivered within a risk reduction framework of preventing injury and adverse events. It is not known how risk is conceptualised in the stroke literature, and how and to what extent biopsychosocial factors such as identity, choice, and the things that give one's life meaning are considered.

Method

A literature search (including Embase, Pubmed, CINHAL, PsychInfo and relevant grey literature) was carried out, including qualitative, quantitative and mixed-methods studies in adults with stroke >18 years. Inductive content analysis was undertaken to describe how risk is currently conceptualised in the stroke rehabilitation literature, alongside critical narrative synthesis of the literature identified.

Results

Risk in stroke rehabilitation is predominantly conceptualised according to a medicalised model relating to i) physical risks such as: falls; risk of further stroke; and harm resulting from interventions ii) risk of cognitive problems and depression; and iii) organisational, social and financial risks. Few papers considered the unintended consequences of risk management in relation to what gives meaning to people's lives post-stroke, nor acknowledged that this approach could generate other risks such as those associated with loss of role and identity. There was little information on the barriers and facilitators to safely resuming previously valued activities and the voice of people post-stroke is largely absent.

Conclusion

Risk is predominantly conceptualised according to the medical model with little consideration given the impacts on a person's identity and ability to make choices that give their lives meaning. Further qualitative research is needed to understand the perspectives and experiences of people post-stroke, caregivers, and health professionals in terms of how risk and risk-management are conceptualised and operationalised during stroke rehabilitation, informing co-design of services.

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What are the rehabilitation needs of acute neuroscience patients?

A service evaluation

Natalie Thrale[1,2], Adine Adonis[2]

Introduction

Neuroscience units provide highly specialist neurology and neurosurgical interventions for patients with complex medical needs. These patients are likely to be physically dependent and have complex rehabilitation needs. Information accurately describing neuroscience patients' physical dependence and rehabilitation needs is essential in planning future service provision. Research evidence quantifying these characteristics is scarce.

Objective

To objectively assess and describe the physical dependence and rehabilitation needs of patients undergoing rehabilitation in a tertiary UK neuroscience unit.

Method

A service evaluation was undertaken for patients treated by the therapy team at a UK tertiary neuroscience unit. Between April 2020 and March 2021, data collected included patients' physical dependence, using the modified Barthel Index (mBI), and rehabilitation needs and were assessed using the Rehabilitation Complexity Scale – Extended (RCS-E). Patients were scored on their rehabilitation needs rather than the rehabilitation that they received.

Results

- 322 patients had complete mBI scores, with 73.3% (n=236) presenting as moderately to totally dependent on initial assessment (mBI 0–11).
- 543 patients had complete RCS-E scores. Of these patients, 37.4% (n=203) had highly complex rehabilitation needs (RCS-E 11–14) and 25.2% (n=137) had very highly complex rehabilitation needs (RCS-E 15–22).
- A total of 37.8% (n=205) of patients required treatment from four or more therapy disciplines; 49.0% (n=266) required daily treatment with a qualified therapist and a therapy assistant; 9.9% (n=54) required two qualified therapists or a minimum of three members of staff to safely treat.

- Standard specialist rehabilitation equipment was required by 77.7% (n=422) of patients and 2.8% (n=15) of patients required customised specialist rehabilitation equipment.

Conclusions

The majority (62.6%) of patients on a tertiary UK neurosciences unit are very physically dependent and have highly complex to very highly complex specialist rehabilitation needs which require a high level of therapy support.

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An audit to establish the feasibility and possible benefits of daily bed/chair exercises for all patients on a stroke rehabilitation unit

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Introduction

An audit was carried out to review the possible benefits and practical implications of daily exercises for patients on the stroke unit.

Objective

This was set to measure the impact of introducing this designated role against the *NICE guideline for stroke rehabilitation in adults* (CG162).

- To review the practical implications of the introduction of a new post to deliver daily bed/chair exercises
- Aim of reducing inactivity, prevent secondary complication of immobility, improve the 24-hour approach to care and improve patient experience.

Method

A new therapy assistant post was introduced to audit daily bed/chair exercises on the stroke rehabilitation unit.

The aim was to treat all rehabilitation patients. Those that were not fit for active exercises received stretches. Patients received this input in addition to normal care and therapy intervention.

Exercise sheets were produced to give to patients, allowing those appropriate to continue exercises independently throughout the day.

Data was collected for the number of patients treated each day (five-day week) over the four-week audit period.

Results

During the audit:

- 4320 extra minutes of treatment
- 288 extra treatments in addition to normal interventions
- 85% of possible treatments were completed; the remaining 15% was due to patients declining or being unwell
- Patient feedback – positive
  - 'It allowed me to feel more in control of my recovery.'
  - 'It was really beneficial to have extra therapy input.'
  - 'It meant I was doing more in the day.'
- Therapist perceived benefits:
  - 100% felt the assigned role was beneficial, well delivered, and improved patient activity.
  - "This role has been extremely popular with all patients on the ward."

Conclusion

Daily bed/chair exercises are achievable using an assigned therapy assistant model. This role provided increased therapy, and enhanced patient experience.

Credit: Mathew Marshall Therapy Assistant

Outcomes of a novel and systematic approach to the management of shoulder pain in a neurorehabilitation setting

Rachel Higgins[1], Celine Lakra[2]

Introduction

Shoulder pain is a common and disabling symptom following neurological injury. In the case of stroke, the majority of patients with shoulder pain experience moderate to severe pain that can persist for many months. Despite the severity and chronicity of shoulder pain, its optimal management remains unclear and wide variation in its management exists. In the absence of clinical guidelines in this area, current evidence and expert multi-specialty opinion were collated to form an Integrated Care Pathway (ICP) in a Level-1 neurorehabilitation unit. The ICP applies a novel and systematic approach to management, identifying four common clinical presentations: frozen shoulder, hypotonic, hypertonic and subacromial pain syndrome.

Method

Patients with shoulder pain admitted between March and November 2021 were assessed and categorised to one or more of the four clinical presentations. Management followed the corresponding stepwise approach outlined in the ICP. Primary outcomes were; Visual Analogue Scale (VAS) for pain at rest, movement and sleep; and pain-free passive range of motion (PFROM) of the shoulder. The VAS was assessed using the 'ShoulderQ' or 'the Scale for Pain Intensity' (SPIN) dependent on cognition and/or communication impairments. PFROM was measured using a goniometer. Outcomes were recorded on admission and discharge.

Results

16 patients with shoulder pain were identified with a mean time post neurological injury of 120 days. Mean difference in pain VAS at rest: -1.1 (+/-3.1) p=0.32, VAS on movement: -2.0 (+/-3.2) p=0.55, during sleep: -0.6 (+/-3.7) p=0.17. Mean difference in degrees of PFROM of external rotation: 18.1 (+/- 24.1) p=0.009, flexion: 21.3 (+/- 24.0) p=0.003, and abduction: 25.8 (+/- 33.7) p=0.008.

Conclusion

The introduction of a shoulder pain ICP for neurorehabilitation inpatients led to statistically significant improvements in shoulder PFROM in all ranges and a trend towards improvement in pain VAS. Ongoing data collection is required due to small patient numbers.

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Understanding rehabilitation need

First steps to informing an integrated rehabilitation approach

Sarah Paterson[1], Janine Ord[2]

Introduction

The NHS Long Term Plan sets out ambitions to improve patient care and reduce pressure on staff through coordinated care, a proactive approach and a differentiated support offer to individuals. An Integrated Rehabilitation Model proposed by the Community Rehabilitation Alliance supports this ambition through holistic assessment and a needs based approach, and provides a framework for integration of rehabilitation including health services and wider community assets. To enable this approach, better understanding of rehabilitation need is required to determine how to focus a proactive, personalised and needs based approach.

Objective

The objective of this project was to describe the rehabilitation needs of the Dorset population and determine options to deliver a needs-based approach to rehabilitation provision.

Method

The project methods were based on Population Health Management. A triangle of population need was used to categorise rehabilitation services across Dorset according to their target population. Mixed methods were used to understand need at patient, service and systems levels and workshop discussions provided options for moving towards an integrated rehabilitation approach.

Results

Rehabilitation need in those living with long-term conditions is not well understood. Acuity or complexity of condition, social support, ability to manage health and wellbeing and healthcare utilisation may be helpful in stratification of risk to identify actual or anticipated rehabilitation need of a population. Rehabilitation is currently provided in linear pathways which limits delivery of a proactive and needs based model.

Discussion

Proactive service provision may be achieved through working towards networked, rather than linear pathways. A 'what matters to you' approach at clinician, service and systems level may help to work towards an integrated approach to provide services based on need rather than condition or pathway.

Acknowledge funding received: This project was completed as a placement on the Consultant Practitioner Development Programme funded by Health Education England, South East.

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Effect of dynamic pressotherapy on vascular, functional and quality of life outcomes in patients with chronic stroke

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Amy Dennis-Jones[2], Louis Martinelli[2],
Eloise Paine[1], Nick Hudson[1]

Introduction

The purpose of this research is to undertake a feasibility/pilot study which will examine the effect of a home-based G-MOVE SUIT exercise training intervention on functional, vascular and quality of life parameters in individuals with chronic stroke.

It is a collaborative research study between Hobbs Rehabilitation, the University of Winchester and WinBack with regards to the G-MOVE SUIT.

Objectives

1. Assess feasibility and patient adherence to using the G-MOVE SUIT in a home-based environment
2. Assess the effect of using the G-MOVE SUIT on clinical functional outcomes of stroke patients
3. Assess the effect of using the G-MOVE SUIT on vascular outcomes (blood pressure, arterial stiffness) of stroke patients
4. Assess the effect of using the G-MOVE SUIT in a home-based setting on quality of life and psychosocial outcomes of stroke patients
5. Assess and interpret patient reflections (perceived barriers, meeting of expectations, motivation, self-efficacy, programme efficacy) of using the G-MOVE SUIT in a home-based environment

Method

Participants will be recruited from Hobbs Rehabilitation and Help Hampshire Stroke clinic to take part in the trial over a twelve-week period. They will be assigned to a control or treatment group. If allocated to the treatment group, participants will be given a range of exercises to perform with the suit. They will be followed up during the twelve-week period and exercises progressed as appropriate.

A battery of outcome measures will be taken at baseline and post intervention. These outcomes will look at changes in vascular health, functional ability, strength as well as quality of life. Adherence to the G-MOVE SUIT and qualitative interviews will also be conducted to determine the usability of the G-MOVE SUIT in a community setting.

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A regional approach to FND service provision across Greater Manchester

Lorraine Azam[1,2], Hannah Jones[3]

Introduction

Functional Neurological Disorder (FND) has an incidence rate of around 4–12/100,000 per year (Aybek and Perez 2022) with around 8,000 new diagnoses per year and between 50–100,000 people living in the community with FND (Bennett *et al* 2021).

Across Greater Manchester (GM), a large geographical area with a population of 3.2 million across seven NHS Trusts, there is inequity in provision of services for this patient group resulting in poor patient experience and outcome.

A need to review the provision of services for FND is driven by new Quality Standards (NICE 2021) that set out the expectations for commissioners and providers and the future development of NICE guidelines (NG10181) that are expected in 2023.

Objective

Improve equity and quality of service provision for FND patients across Greater Manchester.

Method

Working party established with neurology, neurorehab and stroke clinicians supported by MCCN managers and GMNISDN.

Identified the patient group needs, regional service gaps, workforce training needs and potential future solutions

Data collection using SSNAP data and 'hot word' searches to identify patient numbers and patient journeys.

Online training to upskill the workforce

Stakeholder event to engage community teams aimed at identifying referral pathways

Results

Data collection was challenging due to variability across the classification systems used by coders (Aybek and Perez 2022) and the impact of a global pandemic. Further work to identify need will be best met by a dedicated service as a central resource for FND.

Formulation of a MCCN FND pathway with access criteria and stepped care treatment pathways (Health Improvement Scotland 2012).

Ongoing work to standardise community referral pathways, identify appropriate community teams and ensure appropriate provision of care.

Recomendation

Completion and submission of a business case for a specialist FND service at the MCCN to provide intervention and further support the development of FND services across GM.

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Effectiveness of falls prevention interventions for people with multiple sclerosis, Parkinson's disease and stroke

An umbrella review

Nicola O'Malley[1,2], Amanda M Clifford[1,2],
Mairéad Conneely[1,2], Bláthín Casey[3,4],
Susan Coote[1,4,5]

Introduction

The implementation of single-diagnosis falls prevention interventions is proving challenging due to limited resources and participants. Similar falls risk factors have been identified across stroke, Parkinson's disease (PD) and multiple sclerosis (MS). Consequently, designing a mixed-diagnosis intervention for these three neurological conditions is a potential solution to these challenges. This umbrella review aimed to investigate the effectiveness of falls prevention interventions for people with MS, PD, and stroke, to inform the development of a mixed-diagnosis intervention.

Method

A systematic literature search was completed. A measurement tool to assess systematic reviews was used to assess methodological quality. Degree of overlap was assessed using a matrix of evidence table. Quality of evidence was rated using the Grading of Recommendations, Assessments, Development and Evaluation algorithm. Findings were presented narratively and through summary of evidence tables.

Results

Eighteen systematic reviews representing 73 unique primary studies were included in the final analysis. Exercise-based interventions were the most frequently investigated across all three conditions, but there were differences in the content and delivery of these interventions. Low to moderate quality evidence was found for exercise-based interventions reducing falls in PD. Best available evidence suggests that exercise can reduce falls in stroke but there was no evidence of its effect in MS.

Conclusion

The evidence suggests that exercise-based interventions reduce falls in PD; however, the findings for MS and stroke are inconclusive. Given the high overlap and low methodological quality of primary studies, the focus should be on developing high-quality trials rather than further systematic reviews, to facilitate progress in this research field.

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Implementing a novel interprofessional assessment clinic for young neurological patients in the face of rehabilitation bed closure during COVID-19

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Objective

To pilot a novel interprofessional assessment clinic provided for young neurological patients referred for rehabilitation in the face of bed closure during COVID-19.

Method

Referrals were screened for inclusion to the pilot service. A subjective tele-triage assessment was performed to identify patients with potential intervention need. Patients and caregivers then attended a 'one-stop-shop' appointment and were seen by a minimum of three clinicians (rehabilitation consultant, PT, OT, rehabilitation nurse or SLT. Targeted clinic intervention ranged from mediation adjustment/prescription, continence advice and targeted exercise prescription equipment provision including non-custom orthosis. Post-clinic referrals were made including: endocrinology, urology, radiology, orthotist and community therapists. Two patients were listed for priority admission. A post-clinic survey was sent to patients and clinicians were surveyed for their feedback on the pilot.

Results

Of 15 patients who attended, nine responded. All patients 'strongly agreed' that they found the appointment beneficial, and liked the access to multiple disciplines at the same appointment. They felt strongly that such a service should continue. Patient comments included: 'instant help given with two physical areas', 'because it was a team it felt like all areas were covered', 'it was helpful to see doctor, nurse and therapists together'.

Clinicians' feedback highlighted that both caregiver and patients separately appeared to gain distinct benefits from the multi-professional clinic. It helped triage patients according to severity of need, especially those awaiting inpatient admission. Concerns raised were that the clinic tended to be quite long and perhaps cognitively draining for some patients struggling with fatigue.

Conclusion

This piloted interprofessional clinic was rated by patients as a strongly positive experience contrary to some perceived clinician concerns. It allowed for a highly selective triage of the most severely impaired patients for inpatient admission to a limited number of beds. Areas for improvement highlighted include optimising staffing and administrative support.

Stroke: what becomes of the broken hearted?

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Background

The Liverpool Heart and Chest Hospital (LHCH) has a dedicated stroke team in a specialist tertiary hospital setting. By acknowledging acute strokes, a known risk of cardiothoracic surgery, LHCH allows for early diagnosis, specialist stroke management and treatment in order to optimise patient outcomes.

Method

In order to clarify the outlier status in incidence of stroke post cardiothoracic surgery according to 2018 *Getting It Right the First Time* (GIRFT), a service evaluation was completed to look at the three- and six-month post-discharge outcomes after stroke at LHCH.

Using retrospective data, 45 patients referred to the stroke team were identified. Thirty-five patients were included: 18 at three months post discharge (3mpd) and 17 at six months post discharge (6mpd) (ten excluded died during their initial admission). The inpatient initial and discharge modified Rankin Scale (mRS) scores were compared to a simplified modified Rankin Scale questionnaire (smRSq) completed by the stroke team lead physiotherapist at the designated points following discharge.

Results

Patients moved from more functionally dependent (mRS 3-5 range) to more functionally independent with less symptoms of stroke (mRS 0-2 range) in both the 3mpd and 6mpd groups. Ordinal scale improvements on the mRS continued for both groups from the time of discharge to the time of telephone follow-up except for two patients who died (cause of death was unavailable to determine if related to stroke). At the time of follow-up, the majority of patients had returned to their original home residence (except for two from the 3mpd group who were in hospital due to an acute admission unrelated to stroke).

Conclusion

The data demonstrate that patients who have had a stroke at LHCH make functional improvements during their inpatient stay and continue to make improvements following discharge.

Collaborate! We can improve the chances of attaining a patient's goals together

A case study of interdisciplinary working

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Introduction

We trialled interdisciplinary working to address the deteriorating condition of a patient with a complex neurological presentation whose impairment and functional measures were on a downward trajectory despite usual MDT input. Personal care of the upper limb was identified as a major concern and this was a passive function task.

Method

After consultation with the lead nurse and senior carers, the physiotheapy department designed a programme to be completed in five minutes or less and incorporated as part of the usual care tasks during waking hours, up to four times per day.

Therapists trained senior carers who were allocated by nursing staff to each day shift for practical cascade training which they incorporated into the normal daily function with other care staff. Written information was provided for reference.

Results

- Additional rehabilitation interventions by carers during month trial numbered 97.
- Improvements in Passive ROM left shoulder abduction from 10 to 65 degrees, lateral rotation -70 from neutral to -15 from neutral, flexion 15 degrees to 35.
- Section A ARMA scores (passive function) improved from 18/32 to 11/32.
- Average time spent by two carers during personal care decreased from 70mins to 40mins.

Carer feedback

"It used to take two of us ages to wash under her arm… she was in so much pain… now she sits in the shower chair… we do her routine and then I support her arm and she actually washes herself , just me and her – absolutely fantastic!"

Discussion

Simple but high frequency interventions by care staff had a significant positive impact on passive function goals.

Collaboration with carers and nursing staff as mutual partners is essential in the practical design/delivery, leading to a successful application.

Implications for future research into interdisciplinary working as a mechanism of increasing intensity of rehab must have nursing / care staff as part of the intervention design.

Is there a role for assistive devices (ADs) in the rehabilitation of patients with functional neurological disorder (FND)?

Two case studies

Yiota Constantinou[1], Glenn Nielsen[2],
Martine Nadler[1], Chris Symeon[1]

Introduction

Consensus opinion is that ADs are not beneficial for treatment of patients with FND. This is because ADs may encourage over-reliance on them and lead to secondary complications. We present two selected cases which challenge this view.

Objective

Two patients with FND who demonstrated limited progress using recommended rehabilitation approaches used ADs to address the goal of re-establishing gait:

- MuSmate or re-establish head control and upright sitting posture
- SOMI neck brace as part of specialist in-patient FND neurological rehabilitation programmes

Methods

Patient A (a 38-year-old female) and Patient B (a 19-year-old female) were admitted for 18 and twelve weeks respectively. Admission aims were to improve mobility, quality of life and develop self-management strategies. Patients participated in individualised programmes tailored to their identified goals, delivered by a multidisciplinary team. After three weeks and eight weeks respectively, progress plateaued and ADs were introduced.

Results

On admission

- Patient A relied heavily on both arms to maintain a standing position and was unable to take a step. Several orthotic devices and adaptive aids were explored
- Patient B was tetraplegic and unable to support her head independently. On admission she used a non-rigid inflatable neck support. External supports were trialled to improve posture enabling therapy engagement and functional activities

Conclusion

ADs are usually not recommended for patients with FND. However, selected patients may benefit if progress plateaus using recommended approaches.

ADs facilitated more effective, targeted rehabilitation enabling Patient A to achieve her goal to walk, and, for both patients, greater independence in personal and domestic activities and significantly improved quality of life.

Careful clinical reasoning and re-evaluation of the benefits and disadvantages of each AD are essential to identify patient suitability and successful goal attainment.

ADs should be temporary adjuncts then gradually discontinued to prevent dependence risking secondary complications.

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A regional approach to spasticity service improvement across Greater Manchester

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Jennifer Harrison[1]

Introduction

Spasticity is a highly prevalent and complex symptom of neurological insult/disease and therefore gaining consistency in a MDT approach at the acute, rehab and community level is challenging (RCP 2018).

Across Greater Manchester (GM) (3.2 million residents and seven NHS Trusts) there is wide variation in spasticity service provision creating inequity across the region.

The GMNISDN have consequently been working with colleagues from across neurorehabilitation and stroke services to look at improving equity and working towards standards set out in RCP guidelines (2018).

Objective

To establish a model of best practice for spasticity management across GM.

Methods

- MDT working party with representation from inpatient and community, stroke and neurorehabilitation services across GM
- Scoping of current practice across GM (2019)
- Review of literature, relevant guidelines, and evidence-based practice
- Liaised with other regions to scope different delivery models
- Creation of GM Best Practice Model for Spasticity Management (2020)
- Pilot audit of a representative sample of services against national standards and GM model (2020)
- Spasticity education conference (2019) and a spasticity webinar series (2021) were held to aid education around pathophysiology, assessment and management of spasticity

Results

- Scoping work and audit identified wide variation in access to spasticity services across GM. It identified areas of good practice, training needs and areas for improvement (such as access pathways, waiting times and follow-up)
- Project highlighted importance of MDT collaboration in treatment planning and evaluation
- GM Best Practice Model being used to aid clinical decision-making and to educate clinicians
- Training events were well attended by GM and national colleagues and were rated as very good/excellent

Future actions

- Post-COVID review of services
- Identification and addressing of further training/education needs
- Exploration of pathway development/improvement to ensure equitable access to spasticity services across GM
- Exploration of the role of non-medical injectors in supporting spasticity services

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Improving mobility after traumatic brain injury with ballistic strength training

Aligning biomechanics and muscle function to exercise prescription to improve mobility following acquired brain injury

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The University of Melbourne, Melbourne, Australia

Over the past 20 years it has become apparent that muscle weakness is the main physical impairment that limits walking and mobility in most adult and paediatric neurological conditions. Resistance training is in many clinical guidelines and receives a 'strong' recommendation from the Australian Stroke Foundation and the US stroke guidelines.

Despite strong evidence that resistance training improves muscle weakness for a wide range of neurological conditions, these improvements have not translated into improved mobility outcomes(1). Two recent reviews have demonstrated that resistance training interventions in neurological rehabilitation are not aligned with muscle function when walking(2, 3). Better translation of resistance training gains is likely to occur if clinical interventions are better targeted, and a conceptual shift from strength training to ballistic or power training occurs(4). Ballistic resistance or power training is a relatively novel concept in neurological rehabilitation, but can be successfully implemented even for the very weak(5). This lecture will outline the biomechanics of, and muscle function for walking, and demonstrate how resistance exercise prescription can be optimally aligned to improve patient outcomes.

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Evidence-based programming

Using instrumented gait analysis to select optimal training parameters

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Global measures, including step length symmetry and walking activity levels may be the best predictors of continued improvement following gait training. Clinicians need user-friendly tools that produce reliable objective spatio-temporal gait data. Historical methods of clinical data collection involve arduous, unreliable methods using stopwatches or pressure mats. Technology can objectively measure gait variable changes in patients; however, the busy clinician requires a system that can easily collect data and organise it in a way that is immediately meaningful and useful, while not interfering with the therapy delivery. Low-to-mid technology options to accomplish this include phone/tablet based applications, including video-based gait analysis and instrumented treadmills that use simple-to-navigate applications to generate easily usable data. Instrumented treadmills allow clinicians to easily and objectively assess gait during walking while maximising steps taken via treadmill training. The data collected can be used immediately to implement gait training and biofeedback programmes specifically targeting increased symmetry and timing of gait parameters.

A systematic review on physical health education interventions for people with Parkinson's

Content, impact and implementation considerations across Parkinson's trajectory

Ledia Alushi[1], James Alexander[2,3],
Julie Jones[4], Louise Lafortune[1]

Introduction

Educational interventions promoting the role of physical activity (PA) aim to address and acknowledge, poor exercise self-efficacy and low outcome expectations, which are well-researched barriers to PA participation in the healthy and people with chronic conditions. However, little is known about the effectiveness of educational interventions in addressing these barriers in people with Parkinson's (PwP).

Objective

To examine the content of education interventions that promote PA behaviour in PwP, and to assess their effectiveness on physical and psychosocial outcomes.

Method

An electronic search (12/2021) of MEDLINE, EMBASE, CINAHL, PubMed PsycINFO, the Web of Science and the Cochrane Library was conducted from 1990 to 2021. Education interventions, alone or combined with other strategies, promoting PA in PwP were included. Quality was assessed using the Johanna Briggs Institute and National Institute of Health quality assessment tools. A narrative synthesis was performed.

Results

Six studies were identified. Five interventions were comprised of education and exercise sessions. Improvement in physical and psychosocial outcomes were suggested but delineating the exact impact of education was impeded due to lack of assessment.

Conclusions

Few interventions exist that provide knowledge and skills promoting PA participation, and fewer are addressed towards newly diagnosed PwP. There is lack of assessment over the effectiveness of education as a tool to facilitate PA participation in PwP. Lack of assessment poses the risk of potentially disregarding effective interventions or adopting ineffective approaches without the evidence. Education interventions can boost PA engagement by increasing factors such as exercise self-efficacy, but further interventions are required to assess this model of relationship.

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Reach for the reps

How many repetitions can be completed within a one-hour physiotherapy-led upper limb online exercise group for clients with neurological impairments?

Sarah Sparkes[1], Sarah Shiner[1], Katie Sayer[2]

Introduction

Upper limb rehabilitation post stroke is well known to be significantly under dosed (Ward *et al* 2019). During the COVID-19 pandemic we set up two weekly upper limb rehab groups on Zoom, with the hope of increasing intensity of exercise practice, building confidence with functional task practice and to motivate individuals to do more work with their upper limb through participation in homework/challenges. We were interested to see what dosage was possible to achieve in a one-hour online class as the participants were making changes and reported gaining somatosensory, motor and emotional benefits to group online exercise.

Method

Physiotherapy students from King's College, London, came to record the dosage of rehabilitation given within a REACH class during their online simulated practice education week. Students observed two REACH groups and 20 participants. They recorded the reps achieved for each exercise within the main circuit and within the functional task practice. Warmup, sensory circuit and cool down exercises were not analysed. Each exercise was completed for two minutes.

Results

- Total reps within main circuit: 11,289
- Total reps within functional task practice: 4,415
- Mean reps per participant per one-hour class: 785.2

Conclusion

King's physiotherapy students concluded that the online upper limb groups allowed:

- Repetitive practice
- Strength/endurance training
- Meaningful functional task practice

Students concluded '. . .they all motivated each other and had fun when doing rehab which was great to see.'

Self management was encouraged with a large emphasis placed on the importance of practice outside of group – setting homework and challenges.

The LEGS team and students noted that a focus on repetitions and being 'counted' in the observed groups meant that:

- quality not always maintained
- full available range not always worked through in quest to gain more reps
- competition between each other which not seen in usual care

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Within-day intrarater and interrater reliability of portable ultrasound measurements of supraspinatus muscle thickness in healthy people

A preliminary study

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University of the West of England, Bristol,
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Background

Glenohumeral subluxation (GHS) and hemiplegic shoulder pain (HSP) are common post-stroke complications reported in up to 81% and 65% of patients respectively. Rotator cuff muscle weakness, especially supraspinatus muscle inactivity is a potential risk factor for both GHS and HSP.

Objective

The aim of this study was to assess within-day intrarater and interrater reliability of portable ultrasound measurements of supraspinatus muscle thickness (SMT) in healthy people prior to testing on people with stroke.

Method

Test-retest design. Seventeen healthy participants (eleven men and six women with a mean age of 24±7 years) were recruited from the university. Seated participants were scanned by two novice assessors using the standardised protocol. The SMT at its widest point was measured using the on-screen calliper both during rest and isometric contraction. Two sets of three measurements were recorded with an interval of ten minutes between sets. Raters were blind to their own measurements (values were obscured by placing a sticker on the ultrasound screen). Reliability was assessed by Intraclass correlation coefficients (ICC), and standard error of measurement (SEM). Minimum detectable change (MDC90) scores were used to estimate the magnitude of change.

Results

Mean SMT for rater one and two were 2.4±0.5 cm (95% Confidence Interval 2.1-2.6cm) at rest and 2.6±0.4 cm (CI% 2.3-2.8cm) during isometric contraction. ICC for the two raters were 0.98 (0.93-0.99), 0.98 (0.95-0.99) at rest and 0.98 (0.95-0.99), 0.98 (0.93-0.99) during isometric contraction. Corresponding value for interrater reliability were 0.95 (0.87-0.98) and 0.95 (0.86-0.98) respectively. The SEM was <0.1cm and MDC90 was <0.2cm across all measurements.

Conclusion

The ultrasound measurements of SMT demonstrate good intrarater and interrater reliability in healthy individuals even when measured by relatively inexperienced raters. It has potential for use as an outcome measure. Further research into reliability of ultrasound measurements of SMT in patients with stroke is required.

Use of optokinetic chart stimulation-based OKCSIB protocol to reduce upper limb spasticity and restore voluntary movements in chronic strokes

A retrospective case series

Benjamin Chitambira
Neurorestorative and Neurorehabilitation Solutions, Ashford, United Kingdom

Introduction and objective

Spasticity after stroke often leads to pain and severe activity limitations. The aim is to report reduction of spasticity and restoration of voluntary movements in chronic strokes.

Design and setting

Retrospective case series in the community.

Participants with chronic spasticity who had 0/5 on the Oxford scale in at least one segment of their affected upper limb were eligible for the study. Informed written consent was obtained from all participants.

Method

Participants looked at the OKCS app three times daily. They had the OKCS based OKCSIB protocol upper limb active-assisted anti-gravity extensor exercises carried out by a therapist once weekly. The Wilcoxon test was used to analyse before and after intervention spasticity and voluntary movement scores. The Modified Ashworth Scale for spasticity was the primary outcome measure and the Oxford Scale for manual muscle strength was a secondary outcome measure.

Results

Out of 25 participants who had been treated for spasticity of the upper limb, only ten participants were eligible for this study. Physiotherapy records of the ten participants were retrospectively obtained for before intervention and after intervention outcomes. The spasticity scores improved significantly with $p < 0.05$. Importantly, the spasticity resolved to transition to recovery of voluntary movements instead of just improvement in the spasticity scores and passive range of motion with $p < 0.05$.

Conclusion

The OKCSIB protocol led to statistically significant and clinically significant reversal of chronic spasticity to the point of making participants regain some voluntary movements.

Effects of electrical stimulation combined with rotator cuff rehabilitation for the management of hemiplegic shoulder pain and glenohumeral subluxation in people with chronic stroke

Praveen Kumar[1], Sarah Harling[2],
Abigail Sparks[2], Jakko Brouwers[2]

Introduction

Hemiplegic shoulder pain (HSP) and Glenohumeral subluxation (GHS) are common post-stroke complications reported in up to 65% and 81% of patients. Poor motor function and prevalence of rotator cuff (RC) muscle weakness increases the risk of developing both HSP and GHS.

Objective

The aim of this study was to assess the effects of electrical stimulation combined with RC rehabilitation in reducing HSP and GHS in people with chronic stroke.

Method

Twenty-five people with stroke (17 men and eight women with a mean age of 62±9 years and a median time since onset of stroke of 18 months) were seen in outpatient settings, of which all had GHS and 17 patients had HSP. GHS (Acromion-greater tuberosity (AGT) distance) and thickness of supraspinatus muscle was assessed using diagnostic ultrasound (US). HSP was assessed with visual analogue scale during rest and on movement. Patients received electrical stimulation to supraspinatus, infraspinatus and teres minor muscles (20-30 min/day) and RC rehabilitation (isometric progressing to strength exercises) for twelve weeks, in addition to routine rehabilitation. Data was analysed using descriptive statistics.

Results

At twelve weeks, 16 patients attended follow-up assessments and mean AGT distance reduced from 2.6cm to 2.4cm. Thickness of supraspinatus at rest increased from 1.3cm to 1.8cm and during contraction increased from 1.5 to 1.9cm. At rest, the majority of patients did not report HSP both at baseline and follow-up period; however, HSP reduced by 60% during movement at the follow-up period.

Conclusion

Electrical stimulation targeting RC muscles combined with strength exercises has potential to reduce GHS and HSP in people with chronic stroke. Ultrasound has potential for use as an outcome measure both in research and clinical fields. Future research should consider investigating the effectiveness of electrical stimulation to RC muscles in a clinical trial both for prevention and treatment of HSP and GHS.

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Remote adult neurorehabilitation by physiotherapists using technologies during and beyond the COVID-19 pandemic

An International Online Survey

Praveen Kumar[1], Sunitha Mysore[2]

Introduction

Physiotherapy rehabilitation is a fundamental component of multidisciplinary management following adult neurological conditions. The COVID-19 pandemic has seen changes in professional practice across the globe and telerehabilitation (TR) delivery has continued care remotely and virtually, given face-to-face unfeasibility.

Objective

The main aim of this study was to explore the remote provision of physiotherapy rehabilitation using technologies in patients with common adult neurological conditions during and beyond the COVID-19 pandemic phase.

Method

A cross-sectional online international survey was conducted using Qualtrics platform and physiotherapists were sent the survey link via professional bodies in Europe, Asia, USA, Australia, Canada, UAE, India, South Africa and Singapore. A questionnaire was developed based on existing literature. Descriptive analyses, including frequencies, percentages and measures of centrality (median) and dispersion (range) were used to summarise the data.

Results

A total of 56 participants who met the criteria of engaging with technology based rehabilitation completed the survey. Only 46 respondents stated their country of work. Of these, 35 (76%) were from the UK, seven (15%) were South Africa, three (7%) from Australia and one (2%) was from UAE. Stroke, Parkinson's, multiple sclerosis and spinal cord injuries were commonly seen conditions. Most common technologies used during COVID pandemic were telephone (98%), video conference (98%), recorded videos (65%), and mobile apps (65%). 45%, 55%, 23% and 6% found it moderate to extremely challenging using telephone, video conference, recorded videos and mobile apps respectively. Lack of support at home (40%), technical issues (30%), internet issues (33%) were some of the reported challenges / barriers for patients to access TR. Up to 82% of therapists were more likely to utilise TR post-pandemic.

Conclusion

Despite reminders we had very low response rates for an international based survey. Based on the responses received, therapists are likely to use technology-based rehabilitation beyond the pandemic phase.

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