Orthotic intervention following Stroke: A survey of physiotherapist, occupational therapist and orthotist practice and views in the UK

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Conflict of interest statement

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Abstract

Background

Orthoses are often used to help promote mobility and rehabilitation for patients in the UK after a stroke. The perspective of stroke therapists in the UK is an important factor determining current practice and orthotic provision.

Aims

The purpose of this study was to investigate the views of orthotists, physiotherapists, and occupational therapists, on the delivery mechanisms and relationships which influence orthoses intervention and provision for stroke patients within in the UK.

Method

A UK based online survey. Participants were stroke therapy clinicians within the acute and community settings recruited via their membership of the British Association of Prosthetists and Orthotists, the Association of Chartered Physiotherapists Interested in Neurology, and the Royal Collage of Occupational Therapists - Specialist Section for Neurological Practice. Data was analysed using descriptive statistics and content analysis.

Findings

A total of 305 questionnaires were completed (64 orthotists, 131 physiotherapists, 110 occupational therapists). 67% (n=190) of respondents identified the optimum timing for initial orthotic assessment as within the first days after stroke/before discharge from hospital. Waiting times and operational

barriers to orthoses provision were perceived to have a negative impact on patients' rehabilitation. Closer working between orthotists and the stroke rehabilitation team is desirable.

Conclusion

The survey found that the use of orthoses and orthotic specialist input are perceived to have an important role within the stroke rehabilitation pathway. Further evaluative research is warranted to explore the optimum timing and benefits, and the intimacy of the orthotist relationship within the stroke rehabilitation team.

Key words

Orthotics; Stroke; Stroke therapist; Rehabilitation

Introduction

Stroke is a leading cause of mortality and disability worldwide and the primary cause of adult disability in the UK (Johnson et al., 2019; The Stroke Association, 2018). Estimates predict the global burden of stroke related illness and disability is set to double by 2035 (Feigin et al., 2014), at substantial individual, economic, and societal costs. The devastating short and long-term physical effects of stroke are of particular significance with an estimated 32% increase expected in the Disability Adjusted Life Years (DALYs) lost between 2015 and 2035 across Europe, with the UK predicted to have the largest absolute increase (Stroke Alliance for Europe, 2020). Nationally, two thirds of stroke survivors leave hospital in the UK with some form of physical disability and half of those continue to live with impairment long-term (The Stroke Association, 2018). Reduced mobility and gait dysfunction are amongst the most commonly reported symptoms post stroke (The Stroke Association, 2018), and many stroke survivors use an orthosis to help address these difficulties in the immediate and longer-term (Bowers & Ross, 2009; International Society for Prosthetics and Orthotics, 2004). Orthotists are the specialist clinicians trained in biomechanics and the prescription of orthoses to promote normal movement and function. Whilst orthotists are primarily responsible for the assessment and provision of orthoses, within the stroke rehabilitation team other clinicians such as physiotherapists and occupational therapists will usually be the primary assessor to identify potential orthotic need, and sometimes fit certain simple types of orthotic devices such as pre-fabricated stock or off-the-shelf orthoses. See Appendix 1 for glossary.

The UK's national clinical guidelines currently require 'access to' orthotic intervention as part of the stroke rehabilitation programme (Intercollegiate Stroke Working Party, 2016) but the mechanisms by which this should be facilitated are unspecified. Within the UK it is usual practice for a team of stroke specialist professionals to deliver the stroke patients rehabilitation both in the hospital and the community. Currently the orthotist is not a named

member of this stroke rehabilitation multi-disciplinary team (MDT), and so other team members, such as physiotherapists and occupational therapists, act as the gateway to orthotic assessment and the provision of orthoses. To understand the influencing factors that direct orthotic management of stroke patients within the UK, it is therefore important to consider the collective perceptions and practices of the different stroke rehabilitation therapists together.

The evidence is clear on the benefit of early mobilising after stroke, as well as the potential detriment when it is delayed (Langhorne, Wu, Rodgers, Ashburn, & Bernhardt, 2017). Ankle foot orthosis (AFO) use to aid with foot drop and promote stance phase stability is the most common orthotic intervention post stroke and commonly acts as an adjunct to physical therapy (Tamburella et al., 2017) promoting quicker and more effective rehabilitation through improvements in static and dynamic balance (Chen et al., 1999; Mojica et al., 1988; R.-Y. Wang et al., 2007; R. . Wang, Yen, Lee, Lin, & Wang, 2005) and ankle kinematics (Gok, Kucukdeveci, Altinkaynak, Yavuzer, & Ergin, 2003; S F Tyson, Sadeghi-Demneh, & Nester, 2013). However, current orthoses provision pathways are not standardised or articulated nationally, and anecdotal evidence suggests that delays and lack of access create barriers to orthotic provision for stroke patients. In 2009 a best practice statement on AFO use was published in Scotland (Bowers & Ross, 2009), which detailed the value of orthotist led orthotic intervention set within the wider stroke rehabilitation MDT, however no such statement has been produced nationally within the UK or on the global stage.

A better understanding of the optimum timing and mode of orthotic provision within the stroke rehabilitation pathway, as well as the role of the orthotist within the wider stroke rehabilitation team is needed. The aim of this study was to develop an online questionnaire and national survey conducted to collate the views of orthotists, physiotherapists, and

occupational therapists, on current practice and perceived influencing factors determining the delivery of orthotic intervention for stroke patients in the UK. This survey report has been produced to conform with the 'Checklist for Reporting Results of Internet E-Surveys (CHERRIES) (Eysenbach, 2004).

Methods

This study consisted of an online survey of physiotherapists, occupational therapists and orthotists with a questionnaire the sole instrument for data collection. The survey was distributed via an email link in two phases for practical ease and live from July-August 2018 and May-July 2019. The primary purpose of both the questionnaires was to identify practice and views of orthoses provision for patients following stroke. Microsoft Forms platform was used to administer the survey totalling 21 questions; 9 multiple choice, 10 free text and 2 Likert scale. A text version of the questionnaire is shown in Appendix 2. Informed consent was determined by a tick box selection and electronic signature prior to beginning the questionnaire.

Survey Participants

Eligible participants were identified through their membership of a professional body namely: The British Association of Prosthetists and Orthotists (BAPO) (n=450), Association of Chartered Physiotherapists Interested in Neurology – Stroke interest (ACPIN) (n=1077), and the Royal College of Occupational Therapists – Specialist Section for Neurological Practice (RCOT-SSNP) (n= 952). Members of each of these bodies are required to be Health and Care Professions Council (HCPC) registered and thus qualified to practice clinically within the UK. All professional body members were contacted via a distribution email and potential participants were required to select whether they work with stroke patients and meet the inclusion criteria at the initial stage of the survey. Participation was voluntary and all responses anonymous.

Survey Design

The survey comprised a mixture of fixed response and free-text answers. For copies of each of the survey questionnaires see supplementary information. The survey was designed by a team of stroke clinicians including an orthotist, physiotherapist and occupational therapists, as well as stroke clinical academic researchers who have experience conducting similar survey studies. Questions covered the following topic areas:

1. Length of time qualified and setting of employment
2. Clinical setting and frequency of contact with stroke patients
3. Usual referral routes and practices for orthoses provision
4. Common clinical presentations of stroke patients
5. Common orthotic prescription
6. Timing of referral and orthotic intervention
7. Barriers and facilitators to orthotic intervention
8. Orthotic influence on rehabilitation goals
9. Orthotics place in the stroke care rehabilitation pathway

Piloting

The questionnaires were initially piloted with local orthotists, physiotherapists and occupational therapists with feedback actioned prior to circulation. The survey was also piloted and reviewed by the Research Committee of the British Association of Prosthetists and Orthotists and approved before distribution to potential participants.

Ethics Approvals

The study was given favourable ethical approval from the University of Nottingham, Faculty of Medicine & Health Sciences Research Ethics Committee.

Data analysis

Data were analysed using Microsoft Excel and the statistical package STATA (version 13) with consultation from a statistician. Quantitative data were analysed using descriptive statistics and summarised to present the demographic characteristics of the participants, the frequency of responses to dichotomous questions, and the distribution of responses on Likert style response scales. A qualitative narrative review of free-text answers was conducted. As described by Reissman (Riessman, 2008), a member of the research team (MGD), immersed themselves within and consolidated the data. Data was then categorised using inductive coding with the codes developed according to the immerging themes from within the data extracts. Coded segments from within the data set were then separated into three themes: 1. Barriers and facilitators to orthotic intervention; 2. Orthotic influence on rehabilitation goals; 3. Orthotics place in the stroke care rehabilitation pathway. These themes were reviewed and validated by the 2nd and 3rd authors through collective discussion and agreement. Selected illustrative quotations which are felt to provide the most representative insight of the themes are included within the findings.

Findings

A total of 305 questionnaires were completed, from 64 orthotists (14.2% of target population and 21% of combined professional sample), 131 physiotherapists (12.2% of target population and 43% of combined professional sample), and 110 occupational therapists (11.6% of target population and 36% of combined professional sample). Total number of responses for each question varied and so 'n =' is included within each table.

Length of time qualified and setting of employment

Clinical role characteristics of the participants are shown in Table 1. Length of experience ranged from less than one year up to 50 years. The overall mean years qualified was 15.88 (SD

9.79). There was also a spread of clinical seniority with respondents working in a range of clinical settings. Overall 75% (n=230) of respondents were employed by the National Health Service (NHS) in the UK, however, 41% (n=26) of orthotists reported working for private companies providing NHS clinics (a common arrangement that many NHS orthotics services have where they are contracted out to private industry).

Clinical setting and frequency of contact with stroke patients

As shown in Table 2 over two thirds of the physiotherapist and occupational therapist respondents see 'more than one stroke patient a day' in their usual clinical caseload, whereas the most popular option (36%) for orthotists was 'several times a week'. Table 2 also shows only 11 orthotists reported seeing the stroke patient within the first week after stroke, with the majority of contact reported as being 'between 2-6 months' and 'between 6-12 months' after stroke, or 'later in rehabilitation'. Conversely physiotherapy and occupational therapy respondents reported they would see stroke patients at every stage following the stroke event with far greater levels of contact earlier on in rehabilitation.

[Insert Table 1 here]

[Insert Table 2 here]

Usual referral routes and practices for orthoses provision

Table 3 shows 38% (n=89) of physiotherapy and occupational therapy respondents reported that they consider orthotic intervention to be potentially beneficial for 60% of stroke patients. However it was reported only 16% (n=37) of those patients would always be referred for orthotic intervention. It was also noted that physiotherapists are the predominant source of orthotic referrals across all settings.

[Insert Table 3 here]

Common clinical presentations of stroke patients

Respondents were asked to report the frequency they would assess common clinical presentations in their stroke patients using a scale of; 0 = 'never seen' up to 5 = 'seen very often' (*mean score for all respondents*). These were, in descending order; Muscle paralysis (upper or lower limb) (*5*); Walking fatigue/difficulty mobilising (*5*); Shoulder/upper limb weakness (*5*); Foot drop (flaccid) (*4.5*); Shoulder/upper limb (spasticity) (*4*); Foot drop (spastic) (*3.25*); Positional or contracture problems (*3.25*). Cognitive and perceptual issues (*4.*5) as well as speech and language difficulties (*4.*75) were also reported as commonly seen by all survey respondents.

Common orthotic prescription

Table 4 details that 54% (n=124) of respondents reported the area of the body most commonly requiring referral for orthotic intervention was the 'Lower limb (foot/ankle)'. Correspondingly, orthotists reported the device they most commonly prescribed was a 'Custom made' Ankle Foot Orthosis. Orthotists also reported that they were more likely to prescribe custom made orthoses generally (51%; n=31) rather than using stock (37%; n=22) or modular (12%; n=7). See Appendix 1 for Glossary.

[Insert Table 4 here]

Timing of referral and orthotic intervention

Table 5 shows the ideal stage for initial orthotic assessment was identified as within the 'First few days/before hospital discharge' (54%), compared to when most patients actually receive

orthotic intervention, 'Whilst under community care or later in rehabilitation' (45%). 13 respondents reported their stroke patients would 'rarely/never' be seen by an orthotist.

[Insert Table 5 here]

Barriers and facilitators to orthotic intervention

Survey respondents were asked free text questions to explore what the barriers and facilitators to orthotic intervention were perceived to be. Key qualitative responses are included below. The main barriers identified were delays in orthosis provision and organisational blocks to referral and multi-disciplinary working. Facilitating factors to successful orthotic intervention were reported as earlier and closer working between the orthotist and the wider stroke rehabilitation MDT.

Eighty three percent of physiotherapist respondents reported experiencing delays, and 73% of occupational therapists respondents, when they have referred stroke patients for assessment by the orthotist. The mean average wait for an inpatient orthotic assessment was stated as 2-3 days and for outpatients between 4-6 weeks. This wait was reported to be up to one year in some areas. With earlier discharge practices following stroke becoming more commonplace in the UK, it was raised by respondents that delays in initial assessment before discharge could have a negative impact on a patient's ability to rehabilitate.

> "Delay in [orthosis] provision impacts negatively on patient's rehab and also on their long-term function, e.g. increased risk of developing deformities. You sometimes have to stop the rehab and start again weeks later once they have their orthosis."
> (Physiotherapist, participant 180)

Orthotists described how they felt delays in their involvement impeded their ability to treat patients, which meant that opportunities for enhancing rehabilitation were lost. Physiotherapists and occupational therapists mirrored this in describing how they felt earlier orthotic input could lead to improved patient outcomes.

> "We can do more but we are not being involved early enough. We are asked to get involved only when problems arise." (Senior Orthotist, participant 271)

> "I feel [orthotics] is vital and often underused by physios. Early effective orthotic input can maximise early patient recovery." (Senior Physiotherapist, participant 136)

Organisational blocks to the referral process were noted with many respondents unable to refer directly to orthotics services and four of the physiotherapist and occupational therapist respondents reported having never referred to an orthotics department and did not know how.

> "Therapists are unable to directly refer so must refer via [General Practitioner] to consultant, and then consultant to orthotics." (Senior Occupational Therapist, participant 35)

> "I have never met an orthotist and don't know how to refer for one. It would be great to have an orthotist working with the rest of the stroke MDT." (Occupational Therapist, participant 55)

The lack of inclusion of the orthotist within the stroke multi-disciplinary team was a recurring theme within the qualitative data. All clinical group respondents talked about the desire for

closer working and the benefits this brings as well as easier access for consultation and knowledge exchange.

> "It would be so valuable to have more funding for orthotics to enable patients to have the opportunity to have a joint physio/orthotist appointment within their inpatient admission. Their [orthotist] involvement should be part of best practice guide lines." (Senior Physiotherapist, participant 128)

Orthotic influence on rehabilitation goals

Using free text questions, respondents were asked to identify the rehabilitation goals they felt orthotics intervention has the most impact on or potential to influence. 'Improve mobility'; 'pain reduction'; 'contracture/subluxation prevention'; 'promote participation in Activities of Daily Living (ADLs)'; 'facilitate cardiovascular exercise'; 'improve independence (to include emotional impact of this)'; 'reduce risk of falls'; and 'augment other treatments' were frequent examples given.

> "[Orthotics can] Improve quality of life, reduce long term disability and dependency on care and health services, enable participation and improve confidence and motivation." (Clinical Lead Physiotherapist, participant 84)

Orthotics place in stroke care rehabilitation pathway

Survey respondents from all clinical professional groups reported through free text questions that they felt orthotics intervention has a key role to play in the stroke rehabilitation pathway, though only 17% felt that current provision was adequate. A recurring theme within the responses was the desire to improve orthotic interventions with increased access to orthotists and closer joint working within the MDT at all stages of post-stroke rehabilitation.

> "Quicker and easier access to orthotics could assist in speeding up the rehab process. Prompt and close joint working with orthotists would be hugely beneficial to our patients." (Occupational Therapist, participant 34)

Overall there was agreement between orthotists, physiotherapists and occupational therapists with an expressed desire to see swifter more efficient interventions and collaborative working within the wider stroke MDT.

Discussion

The results of this survey highlight the important relationship between physiotherapists, occupational therapists and orthotists in orthotic intervention and provision post stroke. Unsurprisingly physiotherapists and occupational therapists as named members of the MDT reported much closer working with stroke patients, often based within stroke specific teams either in the community or within acute hospital settings. This leads to a role as gatekeeper for orthotist referral or provision of orthotic intervention. The consensus amongst physiotherapists and occupational therapists was found to be that orthotic intervention was potentially beneficial for the majority of patients, however barriers to referral and access appeared to influence how many of these patients went on to be assessed for orthoses. Muscle paralysis and walking fatigue/difficulty mobilising reported as the most commonly seen physical effect of stroke by therapists correlates with data produced by the Stroke Association (The Stroke Association, 2018). This also correlates with the finding that orthotists are most likely to prescribe an Ankle Foot Orthosis, with the lower limb (ankle/foot) being the area of the body most often requiring orthotic intervention.

Timing was identified as being an important factor influencing orthotic intervention for stroke patients, with waiting times perceived to have a negative impact on overall rehabilitation success following stroke. The disparity between the perceived ideal time-point for initial orthotic assessment and intervention, and the actual time-point is of particular interest especially with the move to earlier discharge practices in the UK and increased use of community rehabilitation provision through Early Supported Discharge (ESD) teams.

Difficulties in access to orthosis provision was a recurring theme with the placement of orthotists predominantly in the outpatient setting and not as part of the stroke rehabilitation MDT a potential impacting factor. When considered in combination with earlier discharge practices following stroke, there is the possibility that stroke patients who would benefit from orthotic assessment are being missed, with referrals only being made much later in their rehabilitation when regrettably waiting times are much longer. The lengthier wait for orthotic assessment of stroke patients as an outpatient particularly raises questions for those patients who have been discharged to ESD services as it is a requirement that these patients should expect to receive rehabilitation and treatment at the same quality and intensity as if they were to remain on a stroke unit (Intercollegiate Stroke Working Party, 2016). Exploration of how stroke outpatient orthotic referrals are categorised and prioritised compared to inpatient referrals would be of interest.

Further research is needed to identify the optimal time for initial orthotic assessment and intervention following stroke and the pathway in which orthotic intervention is facilitated. There are indications within the literature to support earlier orthotic intervention in enhancing the effect of other therapies, promoting more successful rehabilitation and offering a prophylactic effect on complication development (International Society for Prosthetics and Orthotics, 2004; Tamburella et al., 2017; The British Association of Prosthetists and Orthotists,

2014). The results of the survey reinforce this by identifying the optimal time point for orthotic assessment as being perceived to be within the 'early' window of treatment, in line with other MDT assessments (Intercollegiate Stroke Working Party, 2016). Moreover, earlier and more efficient orthotic intervention for stroke patients has the potential for wider reaching cost-saving implications given that it has been reported for every £1 spent on orthotics service improvements, the NHS could save up to £4 (Boxer & FLynn, 2004).

Strengths and limitations of the study

The results of this study offer important insight into orthotic intervention practices following stroke in the UK. However, there are certain limitations to be recognised. The targeted participants were drawn from only three particular professional bodies and the voice of stroke survivors and their carers is not included in this narrative. This survey had a higher response rate from physiotherapy and occupational therapy colleagues than orthotist colleagues perhaps reflecting the much greater numbers of physiotherapists and occupational therapists practicing in the UK, approx. 50,000 physiotherapists, 40,000 occupational therapists and 1000 prosthetist/orthotists. Responses from other health care professionals working with stroke rehabilitation would strengthen the findings. A further limitation is the subjectivity of the language which forms the answers to some of the fixed survey questions such as 'quite frequently' or 'several times a week'. Such language has no definitive definition allowing greater interpretation by each respondent but also adding a challenge if repeating the survey.

As the survey was exploratory in nature the analysis has been primarily descriptive, and so no definitive conclusions can be drawn. The cohort of respondents is a very small representation of the wider stroke rehabilitation work force within the UK, and those who responded are likely to be self-selecting as clinicians who are involved with orthotic management following stroke. The research team is made up of an orthotist and two occupational therapists who will

be influenced by their clinical experiences of orthotic interventions. To address this, the survey was developed and initially piloted with a wider group of stroke therapists and clinicians, and approved by an established stroke research patient and public engagement group (The Nottingham Stroke Research Partnership Group), who supported its distribution and welcome its results and findings.

Conclusion

The findings from this survey highlight the perceived importance of orthotic intervention in the stroke rehabilitation pathway. However, there are challenges and barriers to efficient and effective delivery. Given our understanding of the potential for orthosis use in aiding mobilisation after stroke (Bowers & Ross, 2009; Nikamp, van der Palen, Hermens, Rietman, & Buurke, 2018; Portnoy, Frechtel, Raveh, & Schwartz, 2015; Ramstrand & Ramstrand, 2010; S F Tyson & Thornton, 2001; Sarah F Tyson & Kent, 2013), stroke survivors may benefit from swifter and more efficient orthotic intervention in augmenting other therapies and aiding their overall recovery. Currently there is a gap in the evidence base with which to authoritatively inform practice in this area and further work is warranted to expand on the preliminary findings of this survey. Evaluative studies exploring the optimum timing and benefits of orthotic intervention as well as the intimacy of the orthotists relationship with the wider stroke rehabilitation team are much needed.

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Table 1: Participant clinical role characteristics

	Orthotist	Physio	OT	All
Clinical Role/ Title	(n=64)	(n=131)	(n=110)	(n=305)
Orthotist	35			35 (11%)
Physiotherapist		37		37 (12%)
Occupational Therapist			49	49 (16%)
Junior	2			2 (0.7%)
Senior	10	22	19	51 (17%)
Advanced/Specialist	4	47	32	83 (27%)
Clinical Lead/Principal	10	15	9	34 (11%)
Consultant therapist		4		4 (1%)
Clinical services manager	1	1		2 (0.7%)
Deputy Head/Head of service	1	1	1	3 (1%)
Clinical Engineer	1			1 (0.3%)
Lecturer/researcher		3		3 (1%)
Retired		1		1 (0.3%)
Length of time qualified in years Mean (SD)	13.33 (11.6)	17.4 (8.8)	15.5 (9.5)	15.88 (9.8)
Predominant clinical setting				
Hospital setting – Inpatient	3 (4%)	61 (47%)	42 (38%)	106 (35%)
Hospital setting – Outpatient	44 (69%)	9 (8%)	12 (11%)	65 (21%)
Clinical building away from hospital	7 (11%)			7 (2%)
Community (general)	5 (8%)	22 (17%)	6 (5%)	33 (11%)
Community (stroke/neuro specific)		37 (28%)	49 (45%)	86 (28%)
Research		1(<1%)	1 (1%)	2 (0.7%)
Retired		1(<1%)		1 (0.3%)
Other	5 (8%)			5 (2%)

Table 2: Clinician stroke patient caseload

	Orthotist	Physio	OT	All
How regularly do you see stroke patients in your clinical caseload?	(n=63)	(n=129)	(n=107)	(n=299)
More than one a day	9 (14%)	90 (70%)	66 (61%)	165 (55%)
About once a day	10 (16%)	14 (11%)	17 (16%)	41 (14%)
About once a week	12 (19%)	1 (1%)	0 (0%)	13 (4%)
Several times a week	23 (36%)	17 (13%)	18 (17%)	58 (19%)
About once a month	6 (10%)	4 (3%)	4 (4%)	14 (5%)
Several times a year	3 (5%)	3 (2%)	2 (2%)	8 (3%)
How soon after the stroke event do you normally see the stroke patient? *(multiple answers possible)*				
First 24 hours	0	35	25	60
First week	11	51	40	102
First month	31	55	49	135
Between 2-6 months	46	76	55	177
Between 6-12 months	37	35	37	109
Later in rehabilitation	47	34	27	108

Table 3: Orthotic referral practices

	Physio	OT	All
How common is it you think your stroke patients *might* benefit from orthotics? *(percentage of time)*	(n=128)	(n=105)	(n=233)
Never (0%)	0	1	1 (0.5%)
Occasional (20%)	16	14	30 (13%)
Sometimes (40%)	29	33	62 (27%)
Quite frequent (60%)	54	35	89 (38%)
Very common (80%)	29	21	50 (21%)
Every patient (100%)	0	1	1 (0.5%)
How common is it for those patients to *actually* be referred for orthotics? *(percentage of time)*	(n=128)	(n=104)	(n=232)
Never (0%)	1	3	4 (2%)
Occasional (20%)	18	17	35 (15%)
Sometimes (40%)	24	15	39 (17%)
Quite frequent (60%)	21	22	43 (18%)
Very common (80%)	43	31	74 (32%)
Every patient (100%)	21	16	37 (16%)

Table 4: Area of the body most commonly referred for orthotic intervention in stroke patients

	Physio	OT	All
Which area of the body would you refer for orthotics most commonly in your stroke patients?	(n=127)	(n=102)	(n=229)
Lower limb (foot/ankle)	91	33	124 (54%)
Lower limb (knee)	2	0	2 (1%)
Upper limb (wrist/hand/elbow)	19	54	73 (32%)
Upper limb (shoulder)	15	15	30 (13%)

Table 5: Stage following stroke perceived benefit Vs actually received orthotics

	Orthotist	Physio	OT	All
At what stage following stroke do you think appropriate patients might benefit from an initial orthotic assessment/orthosis?	(n=63)	(n=120)	(n=98)	(n=281)
First 24 hrs	11	12	14	37 (13%)
First few days/ before hospital discharge	46	63	44	153 (54%)
At discharge to the community	6	17	18	41 (15%)
Whilst under community care / Later on in rehabilitation	0	28	22	50 (18%)
Never/ Rarely	0	0	0	0 (0%)
What stage following stroke would appropriate patients actually be seen by an orthotist/fitted with an orthosis?	(n=63)	(n=120)	(n=98)	(n=281)
First 24 hrs	0	0	2	2 (<1%)
First few days/ before hospital discharge	22	35	24	81 (29%)
At discharge to the community	22	19	17	58 (21%)
Whilst under community care / Later on in rehabilitation	19	61	47	127 (45%)
Never/ Rarely	0	5	8	13 (5%)

Appendix 1

Glossary

Acute setting: A location where healthcare interventions are provided that is within a hospital trust site.

Biomechanics: Biomechanics is the science of movement of a living body, including how muscles, bones, tendons, and ligaments work together to produce movement. Biomechanics is part of the larger field of kinesiology, specifically focusing on the mechanics of the movement.

Contracture: A permanent shortening of a muscle or joint due to loss of motion over time due to abnormal shortening of the soft tissue structures spanning one or more joints. Damage to the brain can result in weakness, decreased motor control, sensation, and spasticity. Through disuse, an affected joint becomes less elastic and stiff and eventually contracted.

Community setting: Any geographical location where healthcare interventions are provided that is not within a hospital trust site.

Custom Orthosis: An orthotic splint or brace that has been made specifically for an individual usually by taking a mould. These usually take longer to provide patients as they have to be manufactured individually and are usually more costly than stock devices.

Drop foot: A common physical symptom of stroke, this is where the patient does not lift the distal aspect of their foot suitably during the gait cycle and so the foot will remain in a 'dropped' position. This commonly leads to the patient tripping and sometimes falling. The dropped foot is usually a results of muscular imbalance of the ankle, where the dorsiflexors are weakened following stroke.

Early Supported Discharge: An intervention for adults after a stroke that allows their care to be transferred from an inpatient environment to a community setting. It enables people to continue their rehabilitation therapy at home, with the same intensity and expertise that they would receive in hospital.

Modular Orthosis: An orthotic splint or brace that is available 'off-the-shelf' and sometimes kept in stock at orthotic departments to allow immediate provision. These devices are manufactured to 'normal' size dimensions but have options for individual adjustment to improve the fit and function for different patients. They are usually less expensive than custom devices but slightly more expensive than stock devices.

Stock Orthosis: An orthotic splint or brace that is available 'off-the-shelf' and usually kept in stock at orthotic departments which allows immediate provision. These devices are manufactured to 'normal' size dimensions and are usually less expensive than custom devices. They can be used as a long-term prescription, as a temporary device whilst waiting for more the permanent device to be made, or to test the suitability of a certain kind of support before deciding on a longer-term prescription.

Appendix 2

Orthotic Intervention following stroke: A survey of physiotherapist, occupational therapist and orthotist practice and views in the UK

Section 1

1. What is your clinical role/title?

_____

2. How long have you been qualified?

_____

3. Which of these options most accurately describes your predominant employer?
   - NHS
   - Private company providing NHS clinics
   - Private company providing private clinics
   - Self-employed/Locum
   - Other _____

4. What kind of clinical setting do you predominantly work in?

Select all that apply

- ☐ Hospital setting – Ward
- ☐ Hospital setting – Outpatients
- ☐ NHS clinic in building away from hospital site
- ☐ Community clinic
- ☐ Other _____

Section 2

5. Do you ever see stroke patients in your clinical caseload?
   - Yes
   - No

   Participants who reply 'No' will be directed to Section 10

6. How regularly do you see stroke patients in your normal clinical caseload?
   - More than one a day
   - About once a day
   - Several times a week
   - About once a month
   - Several times a year
   - Other _____

7. How soon after the stroke event would you normally see the stroke patient?

Select all that apply

- First 24 hours

- First week
- First month
- Between 2-6 months
- Between 6-12 months
- Later in rehabilitation due to secondary complication
- Established patient with long term use of orthotic device

Section 3

8. Where do your stroke patient referrals usually come from for each of these clinical settings?

Select all that apply

In-patient/on the ward

- Consultant
- Doctor/Nurse
- Physio
- OT
- Patient self-referral
- Other_____

Outpatient clinic

- Consultant
- Doctor/Nurse
- Physio
- OT
- Patient self-referral
- Other_____

Community based

- Consultant
- Doctor/Nurse
- Physio
- OT
- Patient self-referral
- Other_____

Section 4

9. Please rate how often you would see the following clinical presentations in the stroke patients under your care:

Foot drop (flaccid)	1 *Never*	2	3	4	5 *Very often*

Foot drop (spastic)	1 *Never*	2	3	4	5 *Very often*

Muscle Paralysis (Upper or lower limb)	1 *Never*	2	3	4	5 *Very often*

Walking fatigue/difficulty	1 *Never*	2	3	4	5 *Very often*

Positional management/ contracture prevention	1 *Never*	2	3	4	5 *Very often*

Shoulder/upper limb (weakness)	1 *Never*	2	3	4	5 *Very often*

Shoulder/upper limb (spasticity)	1 *Never*	2	3	4	5 *Very often*

Pain management	1 *Never*	2	3	4	5 *Very often*

Cognitive or perceptual issues	1 *Never*	2	3	4	5 *Very often*

Speech and Language difficulties	1 *Never*	2	3	4	5 *Very often*

If there are any factors or conditions you think we have missed or would like to tell us more about please say here:

_____

Section 5

10. Please rate how commonly you would consider prescribing the following orthoses for the stroke patients under your care:

AFO (Stock)	1 *Never*	2	3	4	5 *Very often*

AFO (Custom)	1 *Never*	2	3	4	5 *Very often*

Resting splint lower limb (PRAFO etc.)	1 *Never*	2	3	4	5 *Very often*

Insoles/Heel raises	1 *Never*	2	3	4	5 *Very often*

Shoulder brace	1 *Never*	2	3	4	5 *Very often*

Hand/wrist brace	1 *Never*	2	3	4	5 *Very often*

Knee brace	1 *Never*	2	3	4	5 *Very often*

Hip brace	1 *Never*	2	3	4	5 *Very often*

Abdominal support	1 *Never*	2	3	4	5 *Very often*

Spinal support	1 *Never*	2	3	4	5 *Very often*

If you think we have missed a commonly used orthotic prescription for stroke patients or would like to tell us more about any mentioned then please say here:

_____

10a. When prescribing an orthosis for a stroke patient, what ***percentage*** of your orders would you say are Off-the-shelf, Modular, or Custom items?*

**Off-the-shelf/stock items are considered to be pre-made orthoses and non-customisable, modular items are pre-made but have the option to personalise the prescription for a patient, a custom item is a made-to-measure device for a specific patient.*

Off-the-shelf (stock)

- 0% - 100%

Modular

- 0% - 100%

Custom

- 0% - 100%

11. Do you ever prescribe/order an orthosis without needing to see the stroke patient?

- Yes
- No

Participants who reply 'No' will be directed to Section 6

12. Please describe how these non-assessment requests are made, buy whom and for what kind of orthotic item:

_____

Section 6

13. In your experience, at what stage following stroke do you think appropriate patients might benefit from an initial orthotist assessment/fitting with an orthosis?
    - First 24 hours
    - First few days/before discharge (acute or rehab ward)
    - At discharge to the community
    - Later on in recovery, possible due to secondary complications
    - Never/Rarely

14. In your experience, at what stage following stroke do you find appropriate patients are actually normally seen by an orthotist/fitted with an orthosis?
    - First 24 hours
    - First few days/before discharge (acute or rehab ward)
    - At discharge to the community
    - Later on in recovery, possible due to secondary complications
    - Never/ Rarely

If there is a discrepancy between your two previous answers, what do you feel are the reasons behind this?

_____

Section 7

15. In your experience, what are the normal referral pathways/waiting times for a stroke patient to be seen by an Orthotist ***on the ward***?

_____

16. In your experience, what are the normal referral pathways/waiting times for a stroke patient to be seen by an Orthotist ***in an outpatient clinic/ in the community***?

_____

Section 8

17. What do you think are the most important ***overall*** rehabilitation goals or outcome measures for someone who has suffered a stroke?

(examples might include: to improve quality of life, to be able to perform daily activities unaided)

_____

18. What do you think are the most important ***orthotic specific*** rehabilitation goals or outcome measures for someone who has suffered a stroke? *

(examples might include: contracture prevention, ability to stand/walk unaided, reduction of pain)

_____

Section 9

19. Do you feel the current system of provision of orthotic devices is sufficient to meet the needs of stroke patients, for both in and out patients?

_____

20. Are there any other comments you would like to make about orthotics and its place in the stroke rehabilitation pathway?

_____

Section 10

21. Do you have any suggestions for areas, specifically in relation to orthotics, which require further research?

_____