SaTH Service Evaluation Final Report

Project Title	
Evaluation of inpatient physiotherapy groups on functional ability, self-reported psychological scales, and length of stay (LOS) in acute stroke patients: A service review of current provision at the Princess Royal Hospital.	
Date of Report	12/01/2026
Your Name	Emily Farla
Evaluator Lead (if different)	
Job Title	Specialist Physiotherapist
Main Base/Place of Work	Stroke and Rehabilitation Ward
Division	Clinical Support Services
Department / Team	Therapies
Name, Job Title, and Email of Line Manager	Fiona Carver Therapy Team Manager, Stroke and Rehabilitation Therapy Team and Early Supported Discharge Team Fiona.carver1@nhs.net
Name, Job Title, and Email of Service Manager	Amy Haines-Eynon Therapy Operational Manager for Inpatient Therapies amy.haines-eynon@nhs.net
Name and Email of Supervisor / contact point with SaTH (applicable only for students and external evaluators where no internal manager has been provided)	
Date closed	
Meeting to be presented at	

Executive Summary

Purpose: The Shrewsbury and Telford NHS trust's acute stroke rehabilitation therapy team set up weekly circuit class therapy (CCT) groups in 2024, running alongside individual therapy (IT) to improve stroke rehabilitation. Physiotherapists, occupational therapists, speech and language therapists and therapy support workers delivered both methods of rehabilitation. The service aimed to provide quality therapy to improve motor and psychological outcomes in the acute stroke population, supported by results reported in current literature. Anecdotal evidence was obtained from attendees that suggested CCT to be a positive addition and so a formal review was indicated. This service review aimed to answer; does attending additional inpatient CCT groups up to three times per week in addition to standard therapy for inpatient stroke patients at the Princess Royal Hospital (PRH), influence motor function, psychological wellbeing scores and impact hospital length of stay (LOS)?

Methods: The service evaluation reviewed notes retrospectively between the months of May and July 2025. All consenting adult patients diagnosed with a stroke in the last 30 days and admitted on to the Stroke and Rehabilitation wards at PRH who were receiving active treatment and referred to therapy were included. The review aimed to collect 30-50 sets of data. Notes were screened to collect inpatient demographics; including gender, age, height, weight, diagnosis, number of groups attended, length of stay, and discharge destination and outcome measures; Modified Rivermead Mobility Index, Distress Thermometer, and Stroke Recovery Perception from baseline and discharge time points. Data was inputted into Excel and SPSS to complete descriptive and inferential analysis. Patient identifiable data was removed to ensure anonymity throughout analysis.

Results: 38/50 stroke inpatients admitted to the stroke rehabilitation ward were found to have complete sets of data (n=38). Of the 38 inpatients nine received IT and 19 attended IT with additional CCT groups. Significant motor improvements were seen in both the IT and additional CCT groups. Significant increases in psychological outcomes and self-perceived improvement scores were seen in the additional CCT group compared to the IT group. There appeared to be no relationship between CCT attendance and LOS.

Conclusions: This service evaluation has shown additional CCT groups delivered alongside IT on the stroke rehabilitation unit at the PRH is a significantly better service in terms of patient perceived improvement and psychological outcomes with an equivalent benefit to IT for motor outcomes. Though no impact of group attendance on LOS was seen, it may be due to the external factors delaying discharge. The findings from this service review support continuing provision of the CCT service and has provided data for comparison with future service reviews. Further research is needed to understand the relationship between CCT attendance and becoming therapy fit for discharge and the impact of inpatient total treatment time by adding CCT to IT for achievement of stroke therapy guidance.

Keywords

Physiotherapy, Acute Stroke, Stroke Rehabilitation, Circuit Class Therapy, Therapy Groups, Functional Outcomes, Psychological Outcomes, Self-perceived Improvement.

Background Information

Stroke is defined as a type of brain injury resulting in damage or death to brain cells, leading to rapidly developing focal or global disturbance of cerebral functions (NICE, 2025). There are two main mechanisms for stroke: cerebral infarction caused by the blockage of a blood vessel in the brain; and cerebral haemorrhage when a blood vessel ruptures in the brain (Byeon and Koh, 2016). Stroke leads to damage and death of the brains' neuronal cells (Rahayu et al., 2020) causing death to 1 in 8 (12%) of people with stroke within the first 30 days in the UK (Stroke Association, 2016). Approximately 100,000 strokes occur every year with 1.3 million people in the UK living with the effects.

Individual ischaemic stroke presentation is widely categorised using the Bamford Stroke Classification System, based on clinical assessment of symptoms to guide potential pathology, treatments, and prognosis (Bamford et al., 1991). Table 1 below outlines the Bamford categories, and the symptoms used to diagnose independently or in addition of CT scan findings (Bamford et al., 1991; Goldemund, 2023).

Table 1. Bamford Stroke Classification Category

Bamford Stroke Classification Category	Symptoms
Lacunar Stroke (LACS)	Motor or sensory deficit only
Partial Anterior Circulation Stroke (PACS)	Two of the following: motor or sensory deficit, hemianopia, higher cerebral dysfunction (dysphasia, visuospatial disorder).
Total Anterior Circulation Stroke (TACS)	All three of the following: motor or sensory deficit, hemianopia, higher cerebral dysfunction (dysphasia, visuospatial disorder).
Posterior Circulation Stroke (POCS)	Isolated hemianopia, brain stem signs, cerebellar ataxia

Szlachetka et al. (2022) reported that of 10,841 stroke patients recorded on the Norfolk and Norwich Stroke and TIA Register between January 2003 and December 2016, 19.7% were diagnosed as TACS 25.8% as LACS 38% as PACS and 16.5% as POCS. Further using stroke classification to predict prognosis reporting that patients with TACS were almost three times more likely to die compared those with LACS (95% CI).

Statistics collated over the period of 2007-2016; indicated that the age of stroke onset is becoming younger with over one third of stokes occurring between the ages of 40 and 69 (Public Health England, 2018). The Stroke Association (2018) report that 65% of the 1.3 million stroke survivors living in the UK left hospital with a disability. This equates to approximately 650,000 people living with stroke in the UK, living with altered quality of life and levels of independence which require ongoing support and rehabilitation (Stroke Association, 2025).

Symptoms of a stroke include sudden weakness and/or sensory loss on one side of the body in approximately 77% of UK people, visual changes in (60%), communication difficulties in 70%, loss of balance, dizziness and difficulties with higher executive functioning for 80% of individuals (Stroke association, 2016; Whitelock, 2019; Stroke Association, 2025). Ongoing disabilities such as paralysis, cognitive impairment, motor, and psychological disorders are reported to affect 60% of survivors with 70% living with speech disorders (Byeon and Koh, 2016). Post-stroke changes in motor function can present as muscle weakness with the potential to reduce limb function, dexterity, co-ordination, and stability (Intercollegiate Stroke Working Party (ISWP), 2023), thereby limiting individuals' activity and participation in areas such as personal care, domestic tasks, work and family roles. Also limiting participation, post- stroke psychological changes commonly present as alterations to cognition, memory, mood, emotion, and psychosocial adjustment (ISWP, 2023). NHS England National Stroke Service Model (2021) and the Integrated Community Stroke Service Model (2022) identified the importance of improving psychological care after stroke identifying an essential need for clinical psychologists within stroke teams to support the delivery of psychological care by the broader team (Intercollegiate Stroke Working Party, 2023).

Shrewsbury and Telford NHS Trust (SaTH) serve a rural population of approximately 500,000 people across Shropshire, Telford and Wrekin and Mid-Wales (SaTH, 2025). The stroke unit based at the Princess Royal Hospital (PRH) consists of an 18 bedded acute stroke ward and a 24 bedded rehabilitation unit, providing acute medical management and rehabilitation for individuals following a stroke. In 2024, approximately 843 stroke patients were admitted to the PRH stroke unit for rehabilitation and treatment (Sentinel Stroke National Audit Programme (SSNAP), 2024). Individuals on the PRH stroke unit, predominantly, receive rehabilitation on a one-to-one or individual therapy (IT) basis, by stroke specialist physiotherapists, occupational therapists (OT), speech and language therapists (SLT) and dieticians supported by therapy support workers (TSW). With no formal psychological input currently available the therapy team aim to support and monitor mood, referring on where appropriate.

In 2023 the ISWP updated stroke guidance outlining an increase in the recommended daily rehabilitation time from 45 minutes per profession, to three hours of active therapy and six hours of activity at least five days a week delivered by physiotherapists, OT's and SLT's (ISWP, 2023; NICE, 2023). Subsequently, the PRH stroke therapy team introduced weekly circuit class training (CCT) groups delivering motor, psychological and communication sessions to increase patient therapy time and support motor and psychological recovery. The groups aimed treatments at addressing individual goals guided by the SSNAP priorities of motor, psychological and communication input in a more fun, social, and interactive environment. Whilst incorporating the international classification of functioning, disability, and health framework (ICF) providing task-based therapy to influence bodily structure and functions through altering the environment and encouraging activity and participation (World Health Organisation (WHO), 2001). Following initial implementation of the CCT inpatients and staff indicated improved mood and goal achievement indicating the benefit of a service evaluation to further inform service development.

Current literature evaluating group therapy for the inpatient acute stroke population is sparse, with as little as nine studies (Nayak et al; 2000; English et al., 2007; Jun et al., 2012; English et al., 2014; Bennett et al., 2015; English et al., 2015; Moon et al., 2018; McDonell et al., 2024; Rozevink et al., 2024) which will be discussed in more

detail within the subsequent literature review. McDonell et al. (2024) completed an observational study evaluating the use of CCT and IT in the acute stroke population; the study supported the use of CCT as an alternative service delivery model for inpatient stroke rehabilitation. They reviewed the medical records of 110 stroke patients' who were receiving either IT or CCT and identified that clinical implementation of CCT significantly increased therapy time whilst delivering functional gains equivalent to IT. English et al. (2015) identified CCT as an effective intervention for increasing therapy input time; with no reduction in walking outcomes compared to IT. From a psychological viewpoint Bennett at al. (2015) reported positive patient perspectives of CCT describing how observation of other patients provided hope and enhanced self-motivation as well as camaraderie with other stroke survivors who valued the opportunity to talk and joke with others in similar circumstances. Similar anecdotal evidence was collected after implementation of CCT at PRH describing enjoyment, motivation, socialisation, and functional improvement when asked to feedback with four questions post-group.
Like English et al. (2015) and McDonell et al. (2024) this service evaluation will review the motor impact of CCT; however, it will also consider the impact on psychological outcomes and length of stay (LOS). This original service review will differ further due to the patient cohort receiving IT with between zero and three additional therapy groups per week. Locally this will provide more structured evidence to be utilised when considering ongoing CCT in the future and explore a potential option to support psychological recovery whilst limited support is available at PRH. Although literature in relation to CCT as a treatment approach in acute stroke rehabilitation is limited to support service recommendations, a further pool of research exploring CCT use in chronic stroke patients in the community is available for consideration in a similar patient population.

The ongoing symptoms experienced by people post-stroke are vast requiring complex treatment plans to rehabilitate psychological and motor disorders alongside other complications such as communication and visual disturbances. Despite the national trend of understaffed NHS stroke units, the recommended daily treatment time has increased leading to the need for stroke units such as PRH to adapt services. A small but growing body of research has indicated benefits of CCT as a method of rehabilitation separate to or alongside IT.

Aims and Objectives

This service review retrospectively evaluated if CCT benefits psychological and motor recovery, in acute stroke rehabilitation inpatients. Rehabilitation begins as soon as life-saving treatment has been given, and the patient is deemed medically stable. Rehabilitation if required continues within the unit up to a few months post-stroke before referral on to other services. The inpatients included within this service review were between 24 hours to three months post-stroke.

The overarching research question for this service evaluation was:

Does attending additional inpatient CCT groups up to three times per week in addition to IT for stroke inpatients at the Princess Royal Hospital, influence motor function and psychological wellbeing scores and impact hospital LOS?

Therefore, the objectives of this service evaluation of the stroke unit CCT groups were:

- To evaluate demographic data for stroke inpatients at the Princess Royal Hospital, including diagnosis, demographics, stroke type, LOS, number of groups attended, outcome measure scores and discharge destination.
- To evaluate the psychological impact on stroke inpatients at the Princess Royal Hospital, following IT with or without attending stroke inpatient CCT group.
- To evaluate the impact on motor function for stroke inpatients at the Princess Royal Hospital, following IT with or without attending stroke inpatient CCT group.
- To compare patient perceived recovery scores for stroke inpatients at the Princess Royal Hospital, attending stroke inpatient CCT groups versus IT.
- To explore the relationship between IT, CCT group attendance and LOS.

Methods

The aim of this service review was to explore if the implementation of CCT achieved the intended improvement in motor and psychological function by providing high quality therapy to stroke inpatients, to move in line with the updated requirements of the ISWP (2023) whilst providing a basic level of psychological support in the absence of a qualified clinical psychologist (Stroke Association, 2023).
Acute stroke inpatients admitted to the stroke rehabilitation ward at PRH, who were for active treatment and consenting to receive standard individual stroke therapy, have been offered additional CCT therapy since June 2024. The therapy professions providing the IT and the CCT group sessions consist of physiotherapists, OT's, SLT's, and TSW's.

The service provided IT treatments consisting of the patient and one to four therapists and/or TSW's for 30-60 minutes of treatment dependent on the inpatient's fatigue. In addition to this, patients were offered specialist stroke rehabilitation CCT groups targeting motor, communication, or psychological development up to three times a week. Ward therapist screened all referrals made to therapies through MDT handover and clinical portal to identify inpatients appropriate for IT. On the day of the CCT the focus of the CCT e.g. upper limb, speech, crafting, standing work, was confirmed and appropriate inpatients whose goals aligned and who were medically stable were invited to join. Each inpatient was individually approached prior to the group to be informed of the session plan and asked to consent to attend if they agree.

CCT involved individual patient transfers into appropriate seating, relocation to the therapy gym for a 60-minute group therapy session prior to further transfers or mobility practice to return to the bed space. All patients could request to leave CCT at any point and where necessary accompanied back to the ward with the attended minutes documented. Two therapists led CCT groups e.g. PT, OT or SLT, supported by one therapist or TSW per three inpatients. Average group attendance was approximately six inpatients. Group themes altered depending on the patient group and therapist leading including topics such as standing exercises, balance work, sensory bombardment to upper and lower limb, singing, music, games, word games,

communication, art and craft, tuck shops and kitchen tasks. Every therapy interaction was documented within the stroke pathway paperwork within patient notes. CCT attendance and IT sessions were recorded on the MDT continuation sheets and the completed outcome measures were filed in the therapy section of the stroke pathway.

Study Location

The service evaluation was undertaken at the PRH in Telford, part of the Shrewsbury and Telford NHS Trust, in fulfilment of a MSc dissertation project undertaken at Keele University. This service review evaluated anonymised data collected from the notes of inpatients on the Stroke and Rehabilitation wards. The wards consist of a 17 bedded acute stroke ward and a 25 bedded stroke rehabilitation unit.

Study Design

As a localised service improvement requiring changes to daily practice a service evaluation was identified as the most appropriate method to gather meaningful data to analyse the impact of CCT groups in addition to IT. Importantly, the evaluation aimed to explore if the intended goals of the service had been met, identify any impact of the service, both intentional and unintentional, and recognise if any future improvements were needed (NHS Institute for Innovation and Improvement, 2017). Service evaluations can incorporate both qualitative and quantitative data (Ashton, 2015), following review of the available outcome measures to retrospectively capture the data, it was clear that most outcomes would consist of quantitative data. Service evaluations can benefit services by enhancing quality, improving effectiveness, demonstrating value and measure impact Clarke et al. 2019).

Patient population

All adult inpatients diagnosed with a stroke (as defined by Bamford stroke classification see Chapter 1) within the last 30 days and admitted on to the Stroke and Rehabilitation wards at PRH who were receiving active treatment and had a therapy referral were included in the service evaluation.

Inclusion Criteria

- Inpatients aged 18 years and over.
- Inpatients diagnosed with an acute stroke classified within the Bamford stroke classification as total anterior circulation stroke, partial anterior circulation stroke, lacunar syndrome, posterior circulation syndrome or haemorrhage.
- Inpatients with a medical plan for active treatment who have consented to treatment.

Exclusion Criteria

- Inpatients diagnosed with traumatic head injury.
- Inpatients on end-of-life care.
- Inpatients presenting with decompensation of stroke - when symptoms of a previous stroke worsen due to the brain being put under pressure due to an infection or other stress on the brain.

Specific consent was not obtained as inpatients data was being used to evaluate the current service provision. However, consent was obtained and documented by the treating therapists prior to attending CCT or completing outcome measures as well as for each IT session and so those for who could not consent at this point, data was not collected.

Sample Size

As this was a service review, a sample size calculation was not required. However, the study size required was determined by considering the average number of inpatients moving through the stroke service per month and setting an achievable number of data sets that could be collected within the period available for the project. Based on this, the service review aimed to capture 30-50 sets of data from eight weeks' worth of notes over the months of May – July 2025.

Outcome Measures:

Primary Outcomes: A team discussion, consisting of physiotherapists,' OT's, SLT's and TSW's, concluded that three of the outcome measures used routinely on admission and discharge would provide quantitative data for analysis covering motor function and psychological elements.

The Modified Rivermead Mobility Index (MRMI) (Lennon and Johnson, 2000) (Appendix 1) is a stroke specific outcome measure that assesses eight motor skills from rolling in bed to completing the stairs. Each item has a score from 0-5, (0 - Unable to complete 1- assistance of one person, 2- assistance of two people, 3- supervision, 4- requires an aid, and 5-independent). In 2000, Lennon and Johnson reported the MRMI to be reliable, valid, and quick (15 minutes), with good test-retest reliability as no significant difference was found between test scores (P= 0.47). Due to the speed of the test and the minimal training required to use it, the MRMI is used routinely on the PRH stroke unit.

The Distress Thermometer (DT) (Appendix 2) is a single-item, patient reported, 11-point visual analogue scale used to ascertain an individual's level of distress. Identified originally for use in oncology (National Comprehensive Cancer Network, 2024) the distress thermometer has been adapted to suit stroke patients (Gillespie and Cadden, 2013). Individuals indicate on a scale from 0 (no distress) to 10 (extreme distress) how they feel at that moment. They can expand on the reasons behind their score and an appropriate plan for support is identified. A stroke-specific problem list is attached to support identification of concerns if required.

Both the MRIM and DT are completed for each stroke patient at initial assessment and repeated at regular intervals including prior to discharge to monitor impact of treatment and support goal achievement.

When groups were initiated in June 2024 the Stroke Impact Scale (SIS) (Duncan et al., 1999) was initially used. On review the SIS outcome was too long for the time available to complete as a regular outcome and so an adapted form of the SIS was introduced. Following team discussions, a shorter outcome based on similar themes was developed to suit the service locally referred to as the stroke recovery

perception measure (SRPM). Two subsequent versions of this were tested and altered in response to patient and staff feedback before agreeing on the final version.

The final SRPM version (Appendix 3), consisted of fourteen questions covering motor and psychological aspects of stroke recovery followed by a 0-100% patient perceptive score on amount of recovery compared to baseline (0% No recovery – 100% post-stroke ability). Due to this being an outcome developed by the team there is no formal evidence to support its use however, the team felt the questions were appropriate for our patient group. The SRPM required no equipment and took approximately ten minutes to complete with minimal training.

Secondary Outcome

LOS was captured for all inpatients and monitored closely by the ward teams and Trust. Measured in days LOS was recorded via the hospitals patient tracking system Clinical Portal. Following discharge LOS was extracted from Clinical Portal and recorded on to the patient data collection sheet.

Patient Data Sheet

A data collection sheet (Appendix 4) was developed to capture.

- Diagnosis and medical management plan to ensure the inclusion criterion is met.
- Age (years)
- Gender
- Number of groups attended per week/ over the four-week period, if any (sessions and length).
- Psychological recovery outcomes: DT and MSRM scores taken on admission, two weekly and on discharge.
- Motor recovery outcomes: MRMI and MSRM scores taken on admission, two weekly and on discharge.
- Length of stay (days).
- Discharge destination

Local approval

Prior to beginning the project, the required permissions were sought from both Therapy management team (Appendix 5) and the Shrewsbury and Telford NHS trust research and innovation team according to trust policy (Appendix 6).

The research and innovation team requested a copy of the outcome of the health research authority's decisions tool (Appendix 7) confirming that NHS ethics approval was not required. Following, the formal proposal (Appendix 8) was reviewed by the team and permission was granted to progress with the project with a request to update them on progress and report the findings.

The therapy management team agreed to the project including the use of anonymised patient data and time to collect it to review the service. As requested, a copy of the formal proposal and university student project ethics committee (SPEC) application (Appendix 9) was requested to be reviewed and kept on file.

Ethical approval

Ethical approval by Keele University School of Pharmacy and Allied Health Professionals (Appendix 10) following a submission of a postgraduate student projects ethics committee (SPEC) application form. The main ethical considerations related to maintaining the anonymity of the collected data, achieved by assigning each data set an ordinal number when reviewing the notes so that anyone reading the data could not attribute that information to an individual. Patient identifiable data must be reviewed and anonymised in the ward environment following information and General Data Protection Regulation (Data Protection Act, 2018) and the NHS Code of Confidentiality (Department of Health, 2003) and stored in locked areas designed for notes. The service evaluation had no perceived risk to the inpatients as it reviewed the treatment they were receiving as a patient on the stroke and rehabilitation unit.

Data collection process

Data collection began in May 2025 and ran throughout June ending in July 2025. Two physiotherapists reviewed the individual patient notes for demographics and

outcome measure scores, as well as LOS from the trust's electronic patient contact record, Clinical Portal, recording the required data on to the patient data sheet. When recording began each patient was assigned a number to anonymise the data. This data was logged on an encrypted spread sheet saved in the hospital computer system only accessible by individual IT access codes. The spread sheet was saved within the Stroke Therapies Z-drive which only the stroke therapy team had access too. Only the anonymised data was stored electronically and analysed to ensure patient identity was protected.

The collected demographics were inputted on a separate tab on the spreadsheet (Appendix 11) with the corresponding number for the patient so the outcome scores could be analysed alongside the specific patient demographics. The numbers of CCT groups attended were recorded alongside the outcome measure scores for baseline, updates and the final data point being at discharge due to IT and the CCT ending and care being transferred to community teams. For data analysis the encrypted anonymised data was analysed using the researcher's (EF) password protected laptop.

All paper documentation and copies of outcome measures remain in the notes and will be held for eight years after the last entry or three years after death, whichever is later, outlined in the NHS records management code of practice (NHS England, 2023).

Missing Data

Missing data was accounted for by increasing the target sample size to allow for missing data sets (Kang, 2013). Missing data occurs when some or all the values of interest are not recorded and is a common incidence within healthcare evaluation. This can occur for reasons such as patients moving from the area of treatment, patient refusal, or inability to answer and professional error (Austin et al., 2021). In relation to this service review missing data occurred due to either or discharge outcome measures or miss filing within the notes. As this is a retrospective review of notes therapists were unable to capture unrecorded outcome measures. Therefore, for the purpose of statistical analysis incomplete data sets were removed accepting

that it would reduce sample size and statistical power increasing type II error (Newman, 2014).

Data analysis

Following completion of the data collection, the raw data was inputted into Excel (Appendix 11) and SPSS (Version 30) (Appendix 12) by the researcher (EF) for analysis. Raw data will be stored safely until the completion and marking of the project, once no longer required the service review data will be destroyed from my personal computer and will be stored on the hospital computer for five years in line with the NHS records management code of practice (NHS England, 2023).

This data collated in this service review was nominal, ordinal and ratio levels of measurement which guided the type of analysis used to analyse the data. The DT, MRMI and SRPM produced ordinal level data due to them using Likert scales which are categories with a meaningful order. The demographic data produced both nominal (gender) and ratio data (height and weight). LOS and the % improvement perceived by the patient treated as ratio data due to them having an absolute zero and a consistent range between two points (Sim and Wright., 2000; Marateb et al., 2014).

Descriptive statistics

Descriptive analysis was completed on the demographic data, LOS and outcome measure scores providing means, median, range and standard deviations for ratio data, or counts and percentage for categorical data. This data (Appendix 11) was then evaluated and displayed in tables and charts to highlight the important findings. Diagnosis and discharge destinations information was recorded as qualitative data to inform the results further if required.

Inferential statistics

Inferential statistics are used to evaluate differences or associations between two or more variables (Marshall and Jonker, 2011). The inpatients included in this service evaluation were divided into two groups dependant on whether they had received IT 23.68% (n= 9) or IT with additional CCT 76.32% (n= 29). A Mann-Whitney U with related samples Wilcoxon signed rank test $p \leq 0.05$ was used to analyse the

between group and within group differences between those attending and not attending CCT for motor, psychological, and patient perceived recovery outcome measures. Additionally, relationships between CCT attendance and length of stay were explored using a Spearman's coefficient (Appendix 12 and 13).

To evaluate statistical relationships between CCT and IT on the primary and secondary outcomes, following Null Hypotheses were developed:

H_0= There is no difference in motor outcomes for inpatients who received individual therapy compared to individual therapy in addition to CCT.

H_0= There is no difference in psychological outcomes for inpatients who received individual therapy compared to individual therapy in addition to CCT.

H_0= There is no difference in patient perceived recovery for inpatients who received individual therapy compared to Individual therapy in addition to CCT.

H_0= There is no difference in LOS for inpatients who received individual therapy compared to individual therapy in addition to CCT.

Rigour

To ensure the rigour of this service evaluation, various steps were taken to reduce bias. The nature of the project being a retrospective service evaluation makes eliminating all bias difficult. The retrospective approach eliminated the risk of data collection bias but the reliance on clinical notes and outcome measures meant missing data was present. Examples of methods used to improve rigour were distancing the researcher from the data collection process, ensuring anonymity by removing any patient identifiable data before analysis and used systematic analysis to evaluate the data.

Analysis and Results

The following chapter presents the results from the service evaluation of PRH's stroke rehabilitation groups.

Demographics

Over a three-month period, May – July 2025, 50 stroke inpatients admitted to the stroke rehabilitation ward at PRH met the inclusion criteria for the service evaluation. Following screening, 12 sets of notes were found to contain missing data, including baseline and discharge outcome measures. A remaining 38 complete sets of data were available amounting to a 76% inclusion rate. Of the 38 inpatients 58% were male (n=22) and 42% were female (n=16) with a mean age of 72 (ranging between 48 and 91 years (SD 9.21). Mean height was 1.71cm with a range of 1.49cm to 1.87cm (SD 0.09) and mean weight was 77.51kg with a range of 40.9kg to 124kg (SD 18.07), as shown in Table 2.

Of the 38 inpatients included 73.69% (n=28) presented with ischaemic stroke, 18.42% (n=7) with haemorrhagic stroke and 7.89% (n=3) diagnosed with mixed ischaemic stroke with bleed as per the Bamford Classification. Out of the 18 attending CCT during their inpatient stay, n=8 attended one session, n=5 attended two sessions and n=5 attended three sessions, eleven inpatients attended between four and 12 sessions (Table 2). On discharge 71.05% (n= 27) of inpatients returned home with differing levels of support, further explained in Table 2 with 18.42% (n=7) going to community hospitals, 7.89% (n=3) going to specialist neuro-rehabilitation centres and 2.63% (n=1) being discharged to nursing homes.

Table 2. Detailed demographics: including gender, age, diagnosis, number of groups attended and discharge destination of the included participants (n=38).			
Demographic		Number (n=38)	Percentage
Gender			
	Male	22	57.89%
	Female	16	42.11%
Age			
	40-49	1	2.63%
	50-59	1	2.63%
	60-69	12	31.58%
	70-79	17	44.74%
	80-89	6	15.79%
	90-100	1	2.63%
Stroke Diagnosis			
	Lacunar stroke (LACS)	6	15.79%
	Posterior circulation infarct (POCS)	7	18.42%
	Partial anterior circulation infarct (PACS)	11	28.95%
	Total anterior circulation infarct (TACS)	4	10.53%
	Haemorrhagic Stroke	7	18.42%
	Other (mixed ischaemic and bleed)	3	7.89%
Number of CCT sessions attended			
	0	9	23.68%
	1	8	21.05%
	2	5	13.16%
	3	5	13.16%
	4	2	5.26%
	5	2	5.26%
	6	2	5.26%
	7	1	2.63%
	8	2	5.26%

	11	1	2.63%
	12	1	2.63%
Hospital discharge outcome			
	Home with Early supported discharge (ESD)	11	28.95%
	Home with package of care (POC)	4	10.53%
	Home with ESD & POC	3	7.89%
	Home with POC and community neuro rehab team and neuro outpatients	6	15.79%
	Home	3	7.89%
	Community hospital	7	18.42%
	Specialist neuro-rehab centre	3	7.89%
	Nursing home	1	2.63%

Motor Scores

To address objective 2, the MRMI and the SRPM scores taken at baseline and discharge were compared between those attending and not attending CCT as outlined in section 3.14 of the methodology. The null hypothesis was determined as H0= there is no difference in motor outcomes for inpatients who received IT compared to CCT in addition to IT. The independent-samples Mann-Whitney U test $p \leq 0.05$ did not produce statistically significant differences in the MRMI baseline ($p=0.973$), MRMI discharge ($p=0.457$), SPRM baseline ($p=0.787$) or SPRM discharge scores ($p=0.262$).

The difference between baseline and discharge data scores for the MRMI and SRPM scores were compared between those attending or not attending CCT. An independent-samples Mann-Whitney U test $p \leq 0.05$ reported no statistically significant differences when comparing the difference in MRMI scores ($p= 0.840$) and SRPM scores ($p=0.866$) from baseline to discharge (Table 3). Therefore, the null hypothesis was accepted that H0= there is no difference in motor outcomes for inpatients who received IT compared to CCT in addition to IT.

Table 3. Results of the IT group and the IT group with additional CCT for tests performed: MRMI and SPRM. Values are the mean and (standard deviation) for baseline and discharge scores and the between group difference (p value B) and within group difference (p value W) between baseline and discharge. No significant differences reported at baseline.

Individual therapy (IT)					IT with additional CCT			
Outcome measure	Baseline	Discharge	p value B	p value W	Baseline	Discharge	p value B	p value W
MRMI	15.7 (12.7)	28.1 (14.8)	0.840	0.042 *	15.2 (8.7)	27.1 (9.6)	0.840	0.001*
SRPM	46.1 (12.1)	58.7 (12.3)	0.866	0.019 *	46.9 (13.7)	57.8 (12.6)	0.866	0.001*

# p<0.05 between group baseline-discharge difference * p=0.05 within group baseline-discharge difference

Statistically significant differences between baseline and discharge data scores for the MRMI (p= <0.001) and SRPM scores (p= <0.001) of those attending CCT and MRMI (p= <0.042) and SRPM scores (p= <0.019) or those not attending CCT using the independent-samples Mann-Whitney U test, and so the null hypothesis was rejected. Table 3 provides a summary of statistical analysis highlighting mean (standard deviation) scores and statistical results.

Psychological Scores

To address objective 3, the baseline and discharge scores of the DT and the SRPM psychological scores were compared between those attending and not attending CCT sessions, as discussed in the methodology (section 3.14). The null hypothesis was determined as H0= there is no difference in psychological outcomes for inpatients who received IT compared to CCT in addition to IT. The independent-samples Mann-Whitney U test $p \leq 0.05$ did not produce statistically significant

differences in the DT baseline (p=0.417), DT discharge (p=0.325), SPRM psychological baseline (p=0.360) or SPRM psychological discharge scores (p=0.457). No differences between baseline and discharge data scores for the DT (p= 0.75) and SRPM psychological scores (p=0.397) using the independent-samples Mann-Whitney U test, and so the null hypothesis was accepted.

However, on further exploration, within group analysis revealed statistical differences between the DT (p= <0.001) and SRPM psychological scores (p= 0.004) of those attending CCT taken at baseline compared to discharge using the independent-samples Mann-Whitney U test (Appendix 13). In comparison to those not attending CCT, no differences between baseline and discharge scores for the DT (p= <0.964) and SRPM psychological scores (p= <0.074) using the independent-samples Mann-Whitney U (Appendix 13). Based on this further testing, the null hypothesis H0= there will be no difference in psychological outcomes for inpatients who received IT compared to CCT in addition to IT could be rejected. Table 4 provides a summary of statistical analysis highlighting mean (standard deviation) scores and statistically significant results.

Table 4: results of the IT group and the IT group with additional CCT for tests performed: DT and SPRM- psychological. Values are the mean and (standard deviation) for baseline and discharge scores and the between group difference (p value B) and within group difference (p value W) between baseline and discharge. No significant differences reported at baseline.

	Individual therapy (IT)				IT with additional CCT			
Outcome measure	Baseline	Discharge	p value B	p value W	Baseline	Discharge	p value B	p value W
DT	3.4 (3.7)	3 (3.1)	0.75	0.964	4.5 (3.1)	1.9 (2.8)	0.75	0.001*
SRPM-Psychological	9.8 (3.8)	12.8 (1.8)	0.397	0.074	11.3 (33)	13.3 (2.9)	0.397	0.004*

# p<0.05 between group baseline-discharge difference * p=0.05 within group baseline-discharge difference

Patient perceived recovery

To address objective 4, the baseline and discharge scores of the percentage of perceived recovery, where inpatients were asked to rate their stroke recovery on a 0-100 scale, were compared between those attending and not attending CCT. The null hypothesis was determined as H0= there is no difference in patient perceived recovery for inpatients who received IT compared to CCT in addition to IT.

The independent-samples Mann-Whitney U test $p \leq 0.05$ identified statistically significant differences between the groups in the percentage of perceived recovery ($p=0.018$) at baseline however, no significant difference was observed in the percentage of perceived recovery between groups at discharge ($p=0.787$).

The difference between baseline and discharge data scores for the percentage of patient perceived improvement were compared between those attending and not attending CCT. The independent-samples Mann-Whitney U test $p \leq 0.05$ identified the difference in percentage of patient perceived improvement from baseline to discharge was statistically significant ($p=.005$) between those attending CCT and those who did not.

To further explore the results, the independent-samples Mann-Whitney U test $p \leq 0.05$ identified a statistically significant difference in the patient perceived improvement percentage ($p= <0.001$) of those attending CCT taken at baseline compared to discharge (Appendix 13). In comparison to a non-statistically significant difference in the patient perceived improvement percentage of those not attending CCT taken at baseline compared to discharge ($p= <0.894$, Appendix 13).
Due to this the null hypothesis H0= there is no difference for inpatient perceived recovery for inpatients who received IT compared to CCT in addition to IT can be rejected. Table 5: provides a summary of statistical analysis highlighting mean (standard deviation) scores and statistically relevant results.

Table 5: results of the IT group and the IT group with additional CCT for tests performed: patient perceived improvement %. Values are the mean and (standard deviation) for baseline and discharge scores and the between group difference (p value B) and within group difference (p value W) between baseline and discharge. Significant difference was noted in patient perspective improvement % baseline.								
Individual therapy (IT)					IT with additional CCT			
Outcome measure	Baseline	Discharge	p value B	p value W	Baseline	Discharge	p value B	p value W
Patient perceived Improvement	55.6 (23.4)	55.6 (32.4)	0.005°	0.894	33.0 (20.4)	63.9 (20.2)	0.005°	0.001*
° p<0.05 between group baseline-discharge difference * p=0.05 within group baseline-discharge difference								

Length of Stay

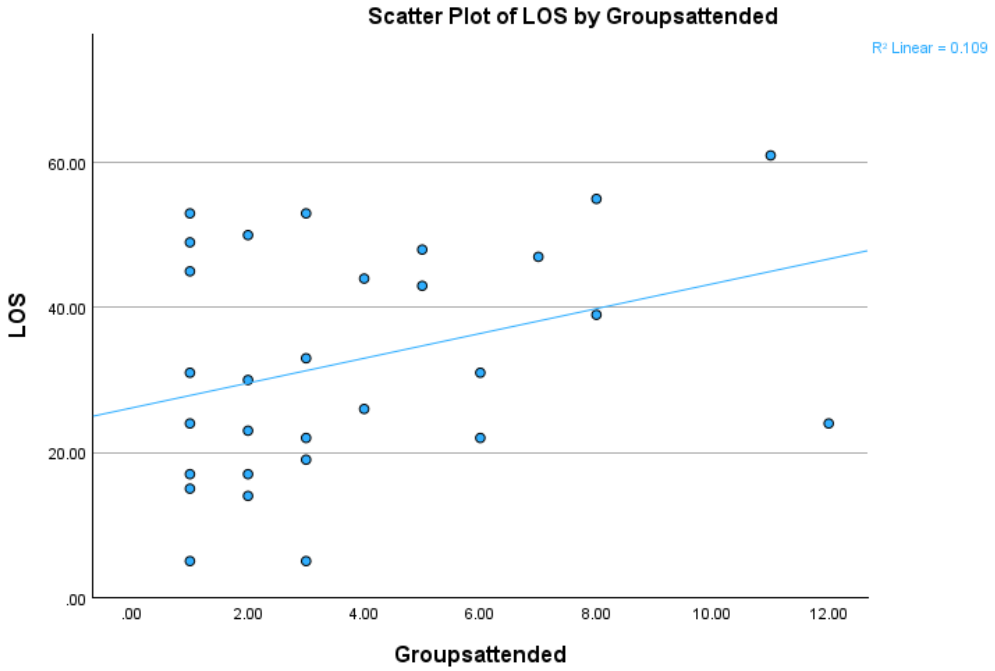
To address objective 5, LOS data was compared between those who attended CCT and those who did not. The null hypothesis was determined as H0= there is no difference in LOS for inpatients who received IT compared to CCT in addition to IT.

Those attending CCT demonstrated and average LOS of 32.6 (SD: 16.6) with LOS ranging from 5-61 days whereas those receiving IT had an average LOS of 26.7 (SD: 13.1) displaying a smaller range of 14-48 days. No significant difference in LOS between CCT and no CCT attendance (p= 0.302), resulting in acceptance of the null hypothesis.

Table 6: results of the IT group and the IT group with additional CCT for LOS. Values are the mean and (standard deviation) LOS and discharge and the between group difference (p value B) between baseline and discharge and the Spearman's correlation (p value S) between LOS and number of groups attended.				
Outcome measure	Individual therapy (IT)	IT with additional CCT	p value B	p value S
LOS	26.8 (13.1)	32.6 (16.6)	0.302	0.117

The relationship or association between LOS and CCT session attendance demonstrated in Figure 1. Briefly describe the trends that are shown. Furthermore, a spearman's correlation $p \leq 0.05$ identified no significant relationship ($p= 0.117$) between number of sessions attended and LOS in those attending CCT (Appendix 13). Table 6 provides a summary of statistical analysis highlighting mean (standard deviation) scores and statistical results.

Figure 1. Scatter plot and line of best fit presenting the relationship between LOS and the number of groups attended.



Discussion

The aim of this service review was to explore if the implementation of CCT groups achieved the intended improvement in motor and psychological function by providing high quality therapy to stroke patients, to move in line with the updated requirements of the ISWP (2023) whilst providing a basic level of psychological support in the absence of a qualified clinical psychologist (Stroke Association, 2023). This chapter will discuss the key findings from this service evaluation in relation to conclusions presented in existing literature. Further to this, the strengths and limitations of the service evaluation are discussed. Lastly, any impact of the stroke CCT service at PRH, both intentional and unintentional, will be explored and future developments of the service considered based on the findings outlined in this service evaluation.

Data collection to address outcome 1 (see results section 4.1) intended to capture thirty to fifty sets of data over the three-month period of May – July 2025. In total fifty sets of notes were reviewed, with 38 containing a full data set for analysis, meaning 76% of appropriate inpatients were included. Review of the demographics indicated a gender spread of more males (58%) than females (42%). Reflective of rates described by Reeves et al. (2008) who reported higher incidence rates in males between the age of 45 and 74 years, whilst higher incidence in women occurred above the age of 74 years. However, general statistics report the prevalence rate as higher in males than females (Evans, 2018). The mean age of 72 reported in this service review is in keeping with the average age of stroke onset reported as 68.2 in males and 73 in females (Evans, 2018).

The spread of stroke diagnosis demonstrated in the service review detailed ischaemic stroke at 73.69%, haemorrhagic stroke 18.42% and mixed ischaemic stroke with bleed 7.89%. Comparable to statistics presented by Palmer (2018) who reported 85% diagnosed with ischaemic strokes and 15% with haemorrhagic strokes. Further to this Haemorrhagic conversion of an ischaemic stroke is reported to occur in approximately 7% of those receiving thrombolysis. Of the 38 inpatients reviewed in the study nine did not attend CCT whilst 29 attended between one and 12 CCT sessions during their admission. The uneven numbers in each group are due to the nature of the service review, by retrospectively looking at notes, data can only be collected from what has historically happened. Providing results based on the clinical picture of the CCT service at PRH. Numbers of CCT sessions attended

also varied for reasons such as fatigue levels, visiting family, medical stability and number of specialities required; those referred to physiotherapy, OT and SLT could be offered up to three groups per week.

5.2 Motor outcomes

Outcome 3 (see results section 4.1) of the evaluation was to understand the impact of CCT and IT on motor recovery post-stroke, achieved, by completing the MRMI and SRMP outcome measures on admission and at discharge for all included inpatients. The results demonstrated no significant difference between the MRMI and SRMP outcome scores recorded for those attending and not attending CCT ($p=\geq 0.05$). However, the difference in the MRMI and SRPM outcomes between the IT baseline and discharge scores (MRMI: $p=0.043$ and SRMP: $p=0.019$) and the CCT baseline and discharge scores (MRMI: $p=0.001$ and SRMP: $p= 0.001$) were significantly improved indicating that both forms of therapy encouraged significant improvement to motor function, benefiting inpatients recovery. Demonstrating that additional CCT sessions at PRH are as effective as IT for motor recovery post-stroke similar to the findings reported by English et al., (2007), McDonell et al., 2024, and Rozevink., (2024). Ko et al. (2015) reviewed motor function in patients attending weekly TOCT for 31 weeks (n=12). Conversely, they found that participants exhibited significant post-group improvement in motor functions such as, impairment, static and dynamic balance as well as mood and emotion. No significant improvements were found in disability, strength, memory and thinking, communication, ADLs, mobility, hand function or social participation. The lack of a control group limited results within Ko et al's. (2015) study, so no comparisons can be made as to the impact of CCT compared to IT. The workstations included in Ko et al's. (2015) intervention consisted of more motor orientated tasks than those used within this service review. To achieve the PRH inpatients' therapy goals and required SSNAP domains the CCT setup, aims and topics differed dependent on if OT, physiotherapist or SLT professionals were leading the group. Session content varied, for example, during communication, relaxation, and singing groups; transfers, mobility, and sitting tolerance would have been the only motor requirement thereby providing little motor rehabilitation. For sessions focusing on motor activities the PRH therapists designed CCT tasks incorporating principles of experience-dependent neuroplasticity, such as specificity, repetition, and intensity to enhance motor

recovery post-stroke, like those included in Ko et al's. (2015) study. Neuroplasticity, important for recovery during CCT and IT, incorporates mechanisms including neuronal regeneration, collateral sprouting, synaptic plasticity, and neurogenesis of the neurons in the brain and relies on appropriate environmental factors, infrastructure, and accessible environments responding well to task specific- training (Aderinto et al., 2023). Treatments designed to enhance motor skills include mental practice, gait, or reach re-education, and task-specific training where functional goal-orientated activities e.g. reaching, walking, and stepping are repeated (Langhorne et al., 2010). IT is favoured over CCT to deliver these treatment approaches as it is reported to achieve more specific individualised treatments (Mostoff, 2024) and offer more active time in tasks (English et al., 2014). Suggesting the availability of therapists in an IT session allows more opportunity to practise tasks that require supervision or assistance to complete safely, whereas, in CCT the patient to therapist ratio is higher, reducing the opportunity for direct supervision and assistance during challenging tasks (English et al., 2014). Within this service review the ratio tended to be one therapist to three patients, with the therapists rotating round to support activity. Research by Bennett et al. (2015) contrasts English et al. (2014) by reporting participants who received both CCT and IT, believed the content of the CCT session was suitably customised to meet their individual ability and needs. Participants in a focus group completed by Vive et al. (2022) identified the CCT to be more individualised and more intense than previous IT sessions, noting CCT was adapted for the individual. At time though participants found treatment borderline impossible, identifying the importance of knowing the patients' ability, approach, and goals, so that with the right skill group CCT can be individualised to the appropriate level to drive motor recovery. Individualisation of CCT groups was achieved within the service review by tailoring therapeutic interventions to the individual stroke patients' needs; recovery is enhanced by capitalising on the benefits offered by neuroplasticity (Aderinto et al., 2023).

Evidence suggests that treatment time spent in CCT is higher than that spent in IT. McDonell et al. (2024) found that those attending group spent significantly more time ($p<0.001$, mean difference of 8.45 minutes) in daily physiotherapy during their rehabilitation than IT. A larger difference described by Lvan de Port et al. (2012) found treatment time per CCT session was 72 minutes and for the IT group 34

minutes (P<0.05). Similar findings reported by English et al. (2014) found CCT duration was longer with a mean difference of 38.0 minutes in comparison to IT. Findings reflective of this service review which saw group sessions running for approximately eighty minutes compared to IT tending to last thirty to sixty minutes, important to note but not confirmed with analysis as IT session length was not formally analysed. English et al. (2014) suggest that sitting tasks and transfer practice comprised a significantly greater percentage of time and walking time was significantly less in CCT compared to IT. Despite less formal 'walking' time in CTT, English et al. (2014) reported that participants step count did not differ significantly between CCT (398 steps: SD 420) or IT (338 steps: SD 430) formats. Thus, indicating walking, though not recognised as formal, must have been occurring during sessions potentially increased by the need to move between activities. The significant improvements seen in both the IT and CCT groups within the service review indicate that the level of motor input achieved in both are equivalent in terms of outcome scores. Thought walking and transfers are often primary goals, seated exercises focusing on hand function, dexterity, movement processing and trunk control are beneficial as many of these activities are needed in tasks of daily life.

Challenges with mobility, cognition and communication reduces an individual's ability to be active outside of dedicated therapy sessions, by increasing contact time and providing more opportunities for activity, stroke survivor's attitude towards engagement in activity may improve (Janssen et al., 2022). Furthermore, increased treatment time within CCT sessions has the potential to increase the number of inpatients seen daily, improve performance against SSNAP targets and continue progression towards goal achievement and functional recovery, and be individualised to the inpatient. Studies such as English et al. (2014), Lvan de Port et al. (2012) and McDonell et al. (2024) all considered either CCT or IT requiring each approach to deliver all requirements of patient therapy in one modality. Conversely, this service review recognises that patients benefit from multiple treatment approaches to deliver different elements of recovery to build the skills required to progress and so has analysed CCT as an addition to IT.

As previously described similar treatment approaches were utilised within both CCT and the IT sessions reviewed in this service evaluation, the main difference being the treatment environment, alongside other stroke patients with the emphasis on

socialisation, joint games, and utilising equipment. There is little opportunity to alter the physical environment within stroke units many like the Stroke Rehabilitation Ward at PRH are placed in non-purpose-built wards. Nevertheless, it is possible to adapt the environment inherited to better suit motor, cognitive, and social rehabilitation, by planning interventions using novel equipment and structured therapy within a stimulating environment designed to encourage activities, known as an enriched environment (Qin et al., 2021). Previous literature indicates that a more enriched CCT service environment at PRH is, consisting of socialisation, music, conversation, laughter, competition, equipment, and games, the better the motor outcomes (Moon et al., 2018; Qin et al., 2021; Lipson-Smith et al., 2023). A supportive treatment environment is crucial to increase engagement, motivation, access to therapy and participation to improve individual outcomes (ISWP, 2023). Lipson-Smith et al. (2023) identified promoting variety and interest in therapy environments, patient-centred setup and allowing for privacy without isolation, as themes to improve patient experience and outcomes. Moon et al. (2018) identified that TOCT utilising rehabilitation tools such as stacking cones, putty, skateboard, and incline boards, demonstrated significant improvements in upper-limb function for outcomes in both the TOCT group and control group who received neuro-developmental treatment (NDT). Furthermore, the TOCT group achieved statistically significant improvements compared to the NDT group in the motor activity log, arm, and grip strengths on the affected side, and using the spoon & chopsticks. Summarising: use of rehabilitation tools within the TOCT sessions increased the upper-limb recovery of function more than standard neurological recovery. Moon et al. (2018) highlighting the use of environment and stimulus, much like the environmental changes and equipment used at PRH in the CCT groups, to improve performance which could explain why CCT, which is suggested to have lower levels of motor activity, produced a similar level of motor recovery to that of IT. CCT sessions at PRH may complement the goals focused on in IT, potentially helping patients' transfer therapy learning to other contexts (Nyack et al. 2000). The current service review has not reported the significant motor improvements described by Moon et al. (2018) and Ko et al. (2015), the spread of CCT content may have impacted on treatments time dedicated to motor function with the inclusion of sessions such as Thai chi, mindfulness, communication, and puzzle completion. These activities provide a lower level of motor focused task-repetition than described

in the studies by Ko et al. (2015) and Moon et al. (2018) which may account for the lack of significant motor improvement compared to IT.

5.3 Psychological outcomes

Due to the strong correlation between motor rehabilitation and the psychological state in post-stroke inpatients whereby, those with more negative emotions make poorer recoveries (Li et al., 2023), Outcome 2 (see results section 4.1) of the service review sought to understand the impact of group CCT and IT on stroke inpatients psychological recovery post-stroke. This was achieved by completing the DT and SRMP-psychological outcome measures on admission and at discharge for all included inpatients. The questions on the SRPM-psychological included ‘how often in the past week have you felt able to participate in day-to-day activities’ or ‘smile and laugh at least once a day?’. The results demonstrated no significant difference in the DT and SRMP-psychological outcome scores between the IT and CCT groups ($p=\geq .0.05$). No significant difference was seen in the DT and SRPM-psychological outcome between the IT baseline and discharge scores (DT: $p=0.964$ and SRMP-psychological: $p=0.074$) however; a significant difference was seen in the CCT baseline and discharge scores (DT: $p=0.001$ and SRMP- psychological: $p= 0.004$). Indicating that a significant improvement in psychological function scores CCT was achieved when attending CCT as an addition to IT. Those attending IT reported lower DT scores at baseline (3.4, SD: 3.7) with little improvement observed at discharge (3, SD: 3.1) however, those receiving CCT reported higher initial DT scores (4.5, SD: 3.1) with discharge scores improving significantly (1.9, SD: 2.8). Lower DT scores indicate the environment, feedback, and opportunities to socialise and have fun led to reduced levels of distress.

This reflects findings by Song et al. (2015), who compared TOCT delivered within IT against TOCT delivered within CCT as an adjunct to IT (n=30) three times a week for four weeks. The self-esteem scale, motivation of rehabilitation, and relationship change scale were used to measure psychological impact. They found that TOCT was more effective when delivered as CCT than IT in terms of self-satisfaction, self-esteem, self-acceptance, and interpersonal relationships. Concluding; that CCT combined with TOCT, produces positive psychological changes for self-esteem, motivation, and relationships in stroke patients, which further affect the psychology of

inpatients during rehabilitation. Reflected also in Ko et al's. (2015) study who reported significant increases in the stroke impact scale areas of mood and emotion after TOCT. Describing how CCT provided patients with a sense of fulfilment, belonging, and problem solving that motivated them and encouraged active participation in the exercises; further instilling in them a sense of purpose, which again improved participation. Quality of life scores have also been identified to respond to CCT, Serrada et al. (2022) reported that body awareness training significantly improved body awareness ($p = 0.002$), quality of life ($p = 0.002$), and arm ($p = 0.025$), and leg ($p = 0.005$) motor impairment scores for individuals in CCT compared to those receiving home-based therapy. Participants reported that the sessions forced them to face their stroke –related limitations to increase awareness and explore alternative ways to use their body highlighting, the importance of personalisation, individual adjustments, and feedback. These studies supporting the findings of this service review that the same treatment approaches can be elevated by delivering it in a social environment to improve mood, motivation, distress, emotions, and participation.

Extrinsic feedback, known as knowledge of results and knowledge of performance has been accepted as a key requirement to promote learning and achieve quality improvement, particularly early on in rehabilitation (Shumway-Cook and Woollacott, 2012). For those receiving IT on the Stroke Unit at PRH, feedback of performance is traditionally delivered by the staff, however Johnson et al. (2013) suggest that group CCT can further enhance extrinsic feedback by giving opportunities for peer support providing encouragement and motivation (Bermudo-Gallaguet et al., 2024). The CCT attended by the inpatients within this service review provided a supportive environment to build relationships with other patients and staff, face their limitations, communicate their experiences, and receive feedback from those around them in similar situations to enhance mood and outlook. Such a group environment improves social adaptability and reduces the psychological sense of loss felt by post-stroke individuals linking with the reduced DT scores seen on discharge In the CCT inpatients. In a study by Janssen et al. (2022), mood and motivation levels differed across stroke survivors and responses given during semi-structured interview (n=33) suggest that both impacted on how they engaged with both rehabilitation and out of therapy time. Participants reported a preference for socialisation to support

engagement; however, lengthy periods with little interaction were described during the normal day limiting motivating, due to the ward setup and processes. Inadequate social support can contribute to reduced motivation, increased stress levels, and limited engagement in rehabilitation activities, hindering the neuroplasticity processes highlighting the need for stroke individuals' empowerment through social support networks (Aderinto et al., 2023). The patient views described by Janssen et al. (2022), provide evidence of the requirement for socialisation to improve motivation, engagement, and fatigue much like the findings of this service review, further demonstrating a place for CCT within rehabilitation protocols.

Inpatient rehabilitation focuses on immediate rehabilitation to achieve goals required for discharge to the community; however, the results of this service review highlight the potential importance of inpatient experience on future rehabilitation behaviours. The significant improvement in psychological outcomes and patient perceived improvement reported in this review for those attending CCT suggest a positive psychological impact of CCT in hospital which literature suggests could be beneficial in longer-term recovery into the community (Nayak et al., 2000; Mehdizadeh et al., 2017). Activities that produce positive psychological improvements are more likely to be adhered to and repeated (Xing et al., 2025). If attending impatient CCT at PRH can normalise and reduce the fear around group settings this may improve patient attendance to support and rehabilitation groups in the community, contributing to individuals long term treatment plans also supporting reintegration to the community. Nayak et al. (2000) used group music therapy to provide a positive opportunity for social interaction in patients with stroke and acute traumatic brain injury. This significantly improved the motivation of participants to engage in social interaction and exercise ($p=0.01$), significantly improving the patient's psychology outcomes ($p=0.10$) in music therapy group compared to those receiving standard therapy. Further to this Mehdizadeh et al. (2017) provided community stroke patients ($n=7$), with six additional CCT sessions in addition to standard community therapy and compared findings to those attending standard therapy ($n=7$). Results indicated that daily group, craft, and mobility activities can affect the performance and satisfaction levels of chronic stroke patients. Music, craft and mobility are all accessible modalities within the community, though not formally researched, it could be argued that by increasing exposure to group activities as inpatients to improve mood and

motivation individuals may be more likely to seek out or attend group provisions long-term; crucial for ongoing improvement in independence, cognition, function, quality of life and mood (Christensen et al. 2019; Nelson et al, 2024). Both Mehdizadeh et al. (2017) and Nayak et al. (2000) studied CCT as an adjunct to IT utilising similar group content (see section 3.2 of the methodology) providing opportunity for more comparison with the results of this service review however, their study population differs due to the inclusion of community stroke patients who may present with less potential for recovery in terms of neuroplasticity (Ballester et al., 2022).

Patient perceived recovery

Self-perceived recovery after stroke impacts quality of life, affecting activity level, and level of life participation (Smith et al., 2024). The results of this service evaluation in relation to outcome 4 (see results section 4.1) found a significant difference in self-perceived baseline scores (p=0.018). Review of the data revealed that the average perceived improvement baseline score for those attending CCT was 32.9 (SD: 20.3) lower than that of those not attending CCT 55.5. (SD: 23.3) indicating baseline perceived improvement was lower in those attending CCT. This trend in the data was potentially due to the patients identified to attend CCT. Between writing the proposal and starting the data collection, the gym space used to deliver CCT was repurposed and a smaller gym space given in return, reducing CCT capacity. Attendance numbers dropped from approximately fifteen patients to five per session and so therapists had to clinically reason who would benefit the most from attending each CCT session based on group topic and individual's goals.

Statistically significant improvements were seen for the difference in patient perceived improvement (p= 0.005) and the difference between baseline and discharge patient perceived scores (p=0.001) in those attending CCT. No significant differences were seen for inpatients perceived recovery in those receiving IT. The environment in which the treatment was delivered again appears to be a key consideration for the patient perceived improvement results obtained from the service evaluation. First identified in animal studies, enriched environments that provide greater opportunity for activity, play, social interaction, and motivation have been seen to promote neuronal activation, signalling and plasticity throughout

various brain regions (Dobrossy and Dunnett, 2001; Nithianantharajah and Hannan, 2006). Smith and Stinear (2016) discuss an abundance of research attempting to improve stroke outcomes by making slight alterations to current task-specific training to promote neuroplasticity reporting unimpressive findings. In comparison Vive et al. (2020) describe improvements in patient self-reported perceptions of improved function, knowledge, and perceptions of rehabilitation needs following group task-specific training in an enriched environment; incorporating environmental modifications to provide multi-sensory stimulation during therapy to individuals. Group provision delivered within the service evaluation included a variety of different tasks and altered the gym set up to provide sessions including tuck shops, sensory stimulation and games, music, teamwork, competition, singing and conversation. Following inpatient identification, knowledge of individual's goals and functional ability was used to develop the session contents, aiming to ensure the appropriate level of task for everyone. The importance of which; highlighted by Smith et al. (2024) who describe how CCT design needs to suits the individual to encourage stroke-recovery and continued progression towards goal achievement and patient perceived improvement. These results suggesting the inpatients attending CCT perceive a functional and psychological benefit following participation.

Length of stay

The secondary objective (see results section 4.1) was to explore if any relationship was present between CCT attendance and LOS. There was no significant difference in LOS ($p=0.302$) between those attending CCT or not, furthermore; there was no correlation ($p=0.117$) indicating a similar variation in LOS across all included inpatients. One explanation for this could be the number of inpatients invited to join group. Since the reduction in the size of the gym space and the requirement to reduce attendance size by two thirds, therapists identified appropriate inpatients whilst aiming for an equitable opportunity for all those appropriate to attend sometimes running two groups to accommodate. Those in the IT group tended to be too unwell, decline or have very mild/severe stroke symptoms potentially leading to less variation in baseline scores.

Using LOS as a measure of benefit for therapy intervention may be limited by the multiple teams and complexities involved in the discharge process. Inpatients

deemed medically and therapy fit for discharge may still require a package of care, community bed, or need an alteration to a property thereby increasing the LOS by days to weeks. This could be why few studies considered the impact on LOS in relation to treatment approach. English et al. (2015) reported that, though not significant LOS was shorter in acute stroke inpatients when receiving 180 minutes a day of CCT with no standard therapy compared to five days a week of standard therapy for four weeks. This was a larger trial (n=259) than this service review (n= 38) and did not compare CCT as an adjunct to standard therapy limiting the comparison. Similarly to this service evaluation, McDonell et al. (2024) completed a retrospective clinical audit of patients admitted to an inpatient stroke rehabilitation ward and reported no significant between-group differences for LOS ($p \geq 0.066$). Despite a similar patient cohort treatment approach again the study differed by not implementing CCT as an adjunct to IT, patients were assigned to either CCT or IT. The lack of significant differences in LOS provides further weighting to the suggestions that CCT is as beneficial as IT in stroke rehabilitation and can introduced as an adjunct to IT without negatively impacting LOS.

Comparisons between motor, psychological and self-perceived improvement findings

It is important to note the main finding of this service review was that the scores taken at discharge were significantly higher than those taken at baseline for both the psychological and self-perceived improvement percentage (0-100%) outcomes within the CCT group. Significant improvement was also seen in the motor outcomes but for both the CCT and the IT groups however, CCT did not produce significantly higher motor outcomes than IT. These results support Nyack et al. (2000), Bennett et al's (2015), Ko et al, (2015) and Lvan de Port et al's. (2021), findings which also reflect the ESO guidance, that CCT sessions' have the potential to be more superior to IT in elements of stroke recovery. The review of CCT at PRH suggests that psychological and self-perceived outcome improvement was significantly improved when CCT was added to IT. Ko et al, (2015) also report that CCT provides more psychological satisfaction compared to IT in chronic stroke patients but contradict this service evaluation by suggesting statistically more improvement in motor function following CCT. External motivation and feedback alongside enriched environments in CCT sessions are significant to delivering a more intense level of sensory stimulation (Qin et al, 2021; Vive et al, 2022). Smith et al. (2024) suggest

that to promote stroke-recovery, participants perceived that being challenged either external or internally was a key factor. The CCT reviewed in this study provided multiple opportunities for encouragement and motivation from several staff members and other inpatients. Participants interviewed in Smith et al's. (2024) study, reported positive views of therapists who pushed them to engage and work harder during rehabilitation seen too in Bennett et al's (2015) study where mutual support and encouragement, gained through interaction with other stroke patients. Thus, group therapy can be a viable alternative for maintaining continued rehabilitation and CCT can be less costly (Ko et al., 2015). Self-perception of recovery is influenced by a complex interaction between environment and the individual differences such as personality, approach, likes, values, and motivation, with some individuals finding different treatment approaches and class environments overwhelming (Vive et al., 2020; Jansen et al., 2022). Highlighting further that recovery response to different therapy environments varies according to individual preferences, reinforcing the need to know your patient and individualise treatments. Psychological Improvements in stroke patients appear to enhance the effect of therapy. Lack of self-support, functional disability and depression are major factors that decrease quality of life in stroke patients (Ko et al., 2015). Therefore, the need to develop CCT groups that consider patients psychology, such as motivation is vital (Song et al, 2015).

The significant psychological improvements reported in this service review suggests that the addition of CCT to IT on the PRH Stroke Unit can provided basic psychological support outlined by NHS Improvement (2011) and the ISWP (2023). Specific to PRH, these guidelines suggesting the stroke MDT provide psychological care to assess and support cognitive and emotional changes ideally alongside specialist psychologist input, cannot be fully met due to the absence of a specialist psychologist. Despite this the addition of CCT would provide an improved psychological service to those admitted thorough the service.

Limitations and strengths

The researcher conducting the service evaluation is a clinician on the Stroke Unit at PRH. The retrospective nature of the study used outcome measures that had already been completed reducing the potential for observer bias to impact the findings. However, the retrospective nature of the study was a limitation, its reliance on clinical notes and outcome measures meant missing data was present. The average missing data rate recorded in 58 studies reviewed by Xin et al. (2025) was 30.22% higher than the 24% rate of missing data within this service review. This sample (n=38) met the desired sample size outlined in section 3.5 of the methodology. Most missing data was due to discharge outcome measures not being completed prior to transfer from inpatient care for reasons such as expedited discharges to support bed flow, last minute notification of bed or care package availability, and caseload pressures.

The loss of gym space post-proposal reduced by two thirds the number of patients who could attend CCT at any one time. This has impacted on the findings discussed as it reduced the number of additional groups each inpatient in the CCT group could attend. Therapists aimed to make attendance equitable by monitoring who had attended, running back-to-back CCT and alternating CCT to different ability levels to maximise the opportunity for inpatients. Conversely, the positive impact reported with smaller groups suggests that CCT can be considered in units with small clinical communal areas; the evaluation may help therapy teams access space. The CCT design was individualised to those attending, facilitating their abilities and goals. A strength of the service review as it aimed to evaluate individualised and meaningful CCT in addition to IT. Conversely, nonspecific content of CCT and differing sessions dependent on the therapy professional (OT, physiotherapy or SLT) leading the session also introduced a limitation reducing repeatability. Though documented in the medical notes the contents of CCT or IT were not collated which meant the type of exercises and ratio of active versus rest time for each could not be commented on. This service evaluation had strengths; it involved analysing group sessions as an adjunct to IT rather than in silo, considering both motor and psychological importance post-stroke and involved clinicians with wide-ranging skills. All providing a more realistic view of the service provided on the Stroke Unit at PRH. Thus, allowing local clinical provision and future service developments to be based on a

cohort of previous patients treated by the current team. The use of the results documented in this service review stops locally due to the nature of the service evaluation meaning the reported findings cannot be generalised to the wider stroke rehabilitation population.

Service and Future Research Recommendations

Service reviews are appropriate only to review a current service, and results can only be used to inform local decision making, not the wider population (Twycross and Shorten, 2014) and so the results attained from this service review can only be used to judge the current group implementation at PRH. However, there is an argument that the results can be used to inform clinicians and researchers of potential areas for future research or service development projects; with service evaluations often being adapted into research studies with little adjustment (Chen and Fawcett, 2019). The stroke rehabilitation patient cohort reviewed in this service evaluation represents a large population, approximately 150 NHS stroke units in the UK treating approximately 100,000 strokes every year (Stroke Association, 2016). Multiple trusts may incorporate CCT within their service development plans. Though these findings cannot be generalised the encouraging results that CCT can significantly impact psychological, and patient perceived recovery scores indicate an area of interest for further service development and research both locally and nationally.

CCT sessions were in addition to IT and tended to run for between 60-120 minutes however the service evaluation did not collect time spent in IT to compare treatment. Though true conclusions cannot be drawn it suggests potential for CCT to increase treatment dose supporting the SSNAP and ISWP requirements to achieve three hours of therapy per day without additional staff. Highlighting an area for future research both locally and nationally to understand CCTs influence on delivering quality therapy whilst achieving increased treatment dose as required by the ISWP guidelines (2023). The CCT sessions varied for each inpatient however, specifics were not captured for analysis, to further expand on CCT content a study design involving variation of CCT sessions to allow for individualisation whilst permitting reproducibility and efficacy within a research setting would be beneficial. Finally, LOS data was not significant within this service review but on reflection the factors external to therapy regularly extended discharge, future research both locally and

nationally may consider recording a therapy fit date instead of or as well as the LOS to give a more representative picture of therapy impact.

The service review has provided evidence to recommend the continued use of the CCT service. Initially the outcome of this service review will be presented to SaTH's therapy management team and research and innovation team. Currently a hospital transformation programme is being undertaken, and it is anticipated that the findings from this service review will influence aspects of the future stroke rehabilitation pathway. The data collected will serve as baseline data to compare with future reviews as service development continues; further review will be beneficial to understand the impact of CCT at PRH on patient satisfaction, staff requirement, and SSNAP achievement.

Conclusion

This service review signifies a new treatment approach for acute stroke rehabilitation inpatients on the Stroke Unit at PRH differing from traditional individual therapy approaches. Although new to PRH, CCT groups have been the subject of previous research and used in other trusts. With renewed focus on stroke rehabilitation following the update of supporting guidelines it was important to benchmark the new service against, patient perceived recovery, psychological, motor recovery, and LOS to guide service development. By exploring the overarching research question: Does attending additional inpatient CCT groups up to three times per week in addition to IT for inpatient stroke patients at the PRH, influence motor function and psychological wellbeing scores and impact hospital LOS?

Demographic data of the inpatients displayed a spread representative of the wider stroke population. This service evaluation revealed that inpatients' receiving CCT or IT demonstrated significant improvements in motor outcomes with significantly improved patient perceived improvement scores and psychological outcomes in the additional CCT group only. Secondly, no relationship between group attendance and length of stay was identified; importantly CCT did not increase LOS.

The inpatients attending CCT reported lower distress scores and more motivation to participate within therapy, benefiting from the enriched environment, social

interaction, and feedback from staff and other inpatients. Further to this their overall perception of their recovery improved significantly for those attending CCT. This psychological improvement may have ongoing benefits increasing the likelihood of ongoing participation in therapy following discharge. The results indicate that inpatient benefit from multiple individualised treatment approaches combined for optimum recovery.

The findings from this service review recommend the ongoing delivery of the CCT service and has provided data for comparison with future service reviews to enable the continued development of services for the stroke inpatients at the Princess Royal Hospital. Further research needs to understand time spent in IT to ascertain if CCT attendance does increase contact therapy time whilst exploring the impact of CCT at PRH on patient satisfaction, staff requirement, and SSNAP achievement. This will help establish if additional development of CCT groups can improve patient experience and recovery outcomes further.

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List of Appendices

Appendix 1 Modified Rivermead Mobility Index (MRMI)

Modified Rivermead Mobility Index (MRMI)	*Patient sticker*

Instructions:

1. Please turn over from your back to your Left/ Right side
2. Please sit up on the side of the bed
3. Please sit on the edge of your bed (the assessor times patient for 10 seconds
4. Please stand up from your chair (patient takes less than 15 seconds)
5. Please remain standing (the assessor times patient for 10 seconds)
6. Please go from your bed to the chair and back again
7. Please walk 10 meters in your usual way
8. Please climb up and down this flight of stairs in your usual way

Score:

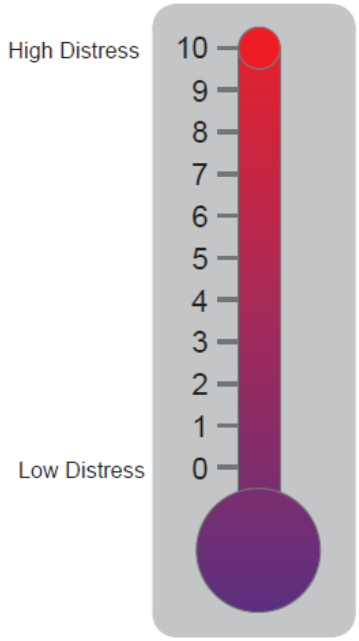
0 = unable to perform
1 = assistance of two people
2 = assistance of one person
3 = requires supervision or verbal instruction
4 = requires an aid or appliance
5 = independent

Task	Date	Date	Date	Date	Date	Date	Date	Date	Date
1. Turning over									
2. Lying to sitting									
3. Sitting balance									
4. Sitting to standing									
5. Standing									
6. Transfers									
7. Walking indoors									
8. Stairs									
Total Score /40									
Therapist Name + Signature									

A score of 19 or above on day 3 of admission post Stroke may predict independent walking ability by 4 weeks. - *Shum et al (2014*

Appendix 2 Distress Thermometer (DT)

1. Please circle the number below (0-10) that describes how much distress, if any, you have felt over the past week.



2. Tick any of the following areas that have caused you distress in the last week.

3. Place an X next to the one which causes you the most distress.

PHYSICAL CONCERNS
- ☐ Arm/Leg weakness
- ☐ Balance / Mobility
- ☐ Bathing / Dressing
- ☐ Toileting (Bowels or Bladder)
- ☐ Eating / Drinking / Swallowing
- ☐ Fatigue / Tiredness
- ☐ Pain
- ☐ Sexual
- ☐ Sleep
- ☐ Vision

MENTAL ABILITIES
- ☐ Thinking / Problem Solving
- ☐ Memory / Concentration

INFORMATION
- ☐ Understanding my diagnosis

EMOTIONS
- ☐ Low mood / Sadness
- ☐ Fears / Worry
- ☐ Anger / Loss of temper
- ☐ Feeling a burden
- ☐ Control of emotions (Crying / Laughing)

PRACTICAL CONCERNS
- ☐ Family responsibilities
- ☐ Living arrangements
- ☐ Transport / Driving
- ☐ Work / Education
- ☐ Leisure / Hobbies
- ☐ Finance / Benefits

FAITH / SPIRITUALITY
- ☐ Spiritual / Religious concerns

RELATIONSHIPS
- ☐ Family / Friends
- ☐ Sexual relationships
- ☐ Staff / Professional carers

COMMUNICATION
- ☐ Speaking
- ☐ Understanding others
- ☐ Reading

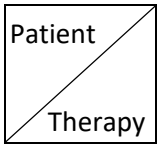
ANY OTHER CONCERNS (not mentioned above)
- ☐
- ☐
- ☐

Action Plan
- ☐ Patient reassured. Monitor distress only
- ☐ Implement practical steps to address patient concern(s)
- ☐ Provide information
- ☐ Consult specialist service (e.g. social work, Psychology, Mental Health team)
- ☐ Refer to a specialist service

Detail of Plan

Distress score	Causes	Action Plan	Therapist and signature	Date

Appendix 3 Stroke Recovery Perception Measure (SRPM)



Patient Label

Date:

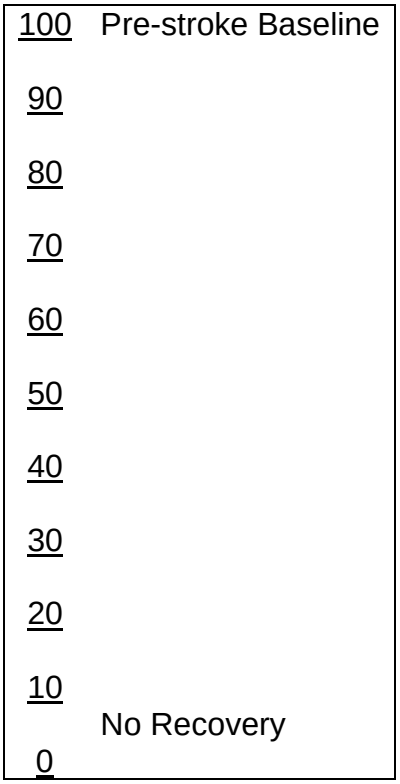
The purpose of this questionnaire is to evaluate how stroke has impacted your health and life. We will ask you questions about impairments and disabilities caused by your stroke, as well as how your stroke has affected your quality of life.

In the past week, how would you rate the strength of…	**A lot of strength**	**Quite a bit of strength**	**Some strength**	**A little strength**	**No strength at all**
1. The grip of your hand that was most affected by your stroke?					
2. The leg that was most affected by your stroke?					

In the past week, how difficult was it…	**Not difficult at all**	**A little difficult**	**Somewhat difficult**	**Very difficult**	**Could not do at all**
3. Stay sitting without losing your balance?					
4. Stand without losing your balance?					
5. Walk					
6. Cut your food with a knife and fork?					
7. Dress the top part of your body whilst sitting?					
8. Brush teeth?					

In the past week, how often did you…	None of the time	A little of the time	Some of the time	Most of the time	All of the time
9. Feel able to participate in day-to-day activities					
10. Smile and laugh at least once a day?					
11. Remember the day of the week?					
12. Concentrate in a conversation					
13. Say the name of family members?					
14. Correctly name objects?					

On a scale of 0 to 100, where would you score yourself on your stroke recovery, with 100 being at your pre-stroke level?



Appendix 4 Patient Data Collection Sheet

Service Development Data Collection Sheet May-June 2025

Patient Name & Number	Dates Groups attended	Rivermead Score/Date	Distress Thermometer	Modified Stroke Impact Scale	Psych	D/C destination

Appendix 5 Shrewsbury and Telford NHS trust Therapy Management Team Permissions

The Shrewsbury and Telford Hospital NHS
NHS Trust

Therapy Services

Princess Royal Hospital
Apley Castle
Telford
TF1 6TF
11.4.25

Dear Emily

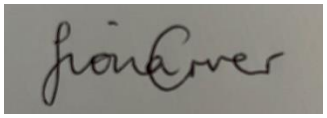
I am writing to confirm that I have read and understood your proposal titled below as part of your Dissertation project at Keele University and support the project as the Team Manager.

Evaluation of inpatient physiotherapy groups on functional ability, self-reported psychological scales and length of stay (LOS) in acute stroke patients: A service review of current provision.

I understand the above will be conducted in compliance with Trust policies and the appropriate teams (namely the Stroke Therapy Team and the Research and Innovation Team) are aware and in support also. I note the anonymised data collection will be in line with Trust policies and procedures.

Good luck with the next steps of your dissertation and the project itself

Yours Sincerely



Fiona Carver

Therapy Team Manager
Therapy Inpatients Stroke and Rehabilitation and Early Supported Discharge
Shrewsbury and Telford Hospitals

Appendix 6 Shrewsbury and Telford NHS trust research and innovation team permissions

The Shrewsbury and Telford Hospital NHS
NHS Trust

Sent on behalf of Jo Sawyer, Head of Research & Innovation

Dear Emily

RE: The Shrewsbury and Telford Hospital NHS Trust Research & Innovation (R&I) confirmation of Service Evaluation

Project Title: Evaluation of inpatient physiotherapy groups on functional ability, self-reported psychological scales and length of stay (LOS) in acute stroke patients: A service review of current provision.

Thank you for informing The Shrewsbury & Telford Hospital NHS Trust R&I Office of the above project.

I can confirm that The Shrewsbury & Telford Hospital NHS Trust has reviewed this project and is therefore issuing R&I Confirmation that it is a service evaluation, which is subject to the following conditions:

- The service evaluation will be conducted in compliance with Trust Policies and carried out in accordance with the General Data Protection Regulation (2018), Human Tissue Act 2004, Health & Safety at Work Act and the Caldicott principles and NHS Code of Confidentiality.

- Any proposed changes or amendments to the project will be notified to the R&I department.

- That information/data sharing is conducted in line with the project proposal and consent.

- Upon completion of the project, you must complete an end of study report and submit this to the R&I department. The executive summary will be published on the Staff Publications Hub page of the SaTH Internet.

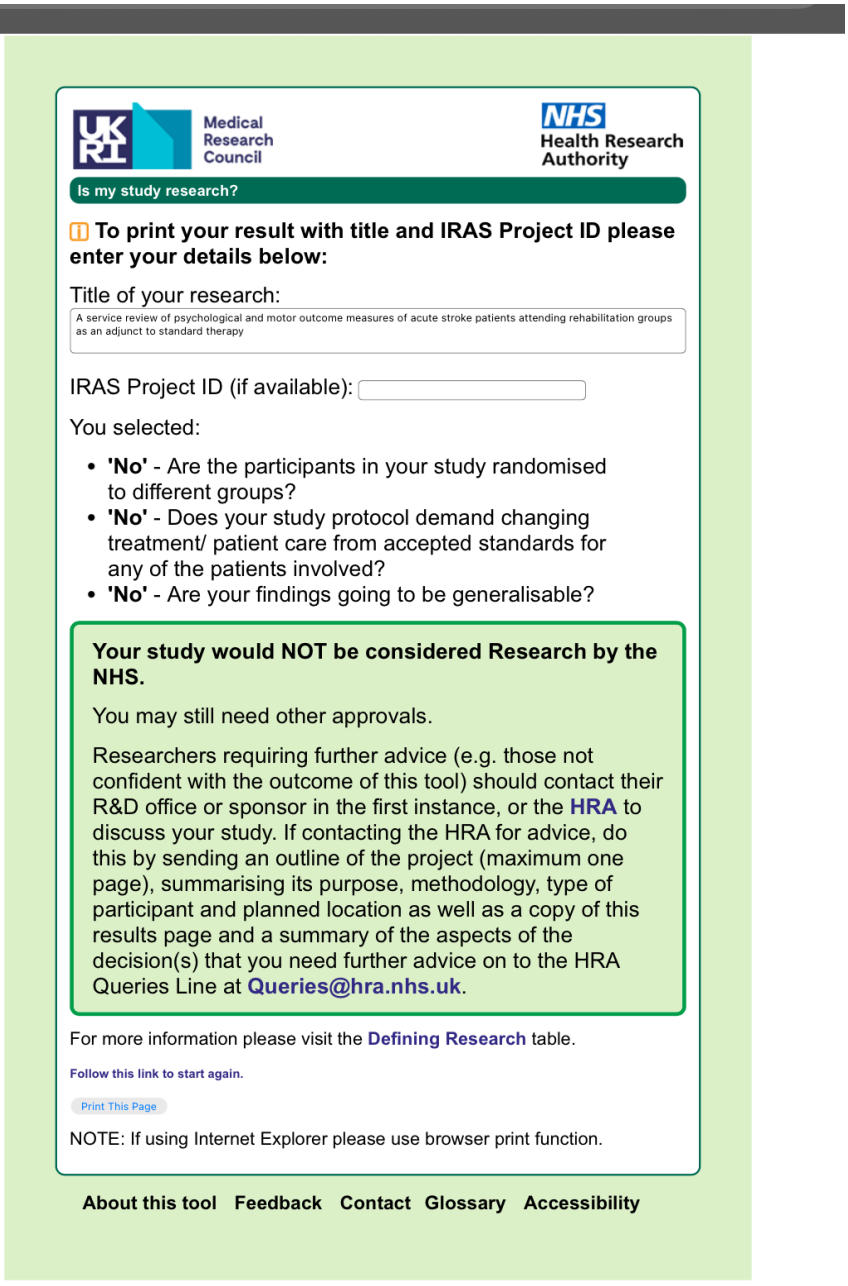
- The lead evaluator must be familiar with SaTH Service Evaluation SOP, which can be found on the Intranet and have up to date Trust Information Governance training.

If you have any queries relating to R&I, please do not hesitate to contact me. The Trust wishes you success with your project.

Yours sincerely

Rachel Rikunenko
Research Governance & Quality Assurance Lead
The Shrewsbury and Telford Hospital NHS Trust
Research & Innovation Department

Appendix 7 Health Research Authority's Decisions Tool



Medical Research Council

NHS Health Research Authority

Is my study research?

To print your result with title and IRAS Project ID please enter your details below:

Title of your research:

A service review of psychological and motor outcome measures of acute stroke patients attending rehabilitation groups as an adjunct to standard therapy

IRAS Project ID (if available):

You selected:

- **'No'** - Are the participants in your study randomised to different groups?
- **'No'** - Does your study protocol demand changing treatment/ patient care from accepted standards for any of the patients involved?
- **'No'** - Are your findings going to be generalisable?

Your study would NOT be considered Research by the NHS.

You may still need other approvals.

Researchers requiring further advice (e.g. those not confident with the outcome of this tool) should contact their R&D office or sponsor in the first instance, or the HRA to discuss your study. If contacting the HRA for advice, do this by sending an outline of the project (maximum one page), summarising its purpose, methodology, type of participant and planned location as well as a copy of this results page and a summary of the aspects of the decision(s) that you need further advice on to the HRA Queries Line at Queries@hra.nhs.uk.

For more information please visit the Defining Research table.

Follow this link to start again.

Print This Page

NOTE: If using Internet Explorer please use browser print function.

About this tool Feedback Contact Glossary Accessibility

Appendix 8 Formal Proposal

SCHOOL OF ALLIED HEALTH PROFESSIONS

Master's Dissertation in Faculty of Health (SAHP) PTY-40044

Dissertation Full Proposal

FOR RESEARCH INVOLVING PATIENTS YOU WILL NEED EXTERNAL ETHICAL REVIEW AND A DIFFERENT FORM

1. Study Team and Research Management

Name of supervisor	Alison Rogers
School	School of Allied Health Professions and Pharmacy
Address	Mackay Building - Rm 0.13, Keele University, Keele, Staffordshire, UK ST5 5BG
Telephone	01782 734759
Email	a.rogers1@keele.ac.uk

Name of student	Emily Farla
Student number	21022834
Name of course/degree	MSc Advanced Physiotherapy (Neurology)

Is funding required for this project?	NO
If yes, please provide details:-	

If required please specify the NHS R&D manager responsible for organising NHS R&D permission for this project
Rachel Rikunenko - Research Governance & Quality Assurance Lead Email: Rachel.rikunenko@nhs.net

Will an NHS honorary contract or confidentiality agreement be required for this project?	NO
Does this project require an NHS supervisor at local level?	NO
If yes, please provide details	

2. Project details

Title of project
Evaluation of inpatient physiotherapy groups on functional ability, self-reported psychological scales and length of stay (LOS) in acute stroke patients: A service review of current provision at the Princess Royal hospital.
What is the principal research question/objective? please provide a clear account of the purpose of your investigation, including primary and secondary objective
This service review will evaluate if inpatient therapy groups developed in March 2024, benefit psychological and motor recovery in acute stroke rehabilitation patients. These circuit class therapy (CCT) groups were implemented in June 2024, since then patient and staff feedback indicates patients who attended groups demonstrate improved mood, function and motivation. As this feedback is anecdotal and self-reported, it is unclear if this translates into a measurable improvement using the below standardised outcome measures alongside individuals recorded length of stay. • Psychological recovery outcomes: Distress Thermometer (DT) and Adapted Stroke Impact Scale (ASI) scores taken on admission, two weekly and on discharge. • Motor recovery outcomes: Modified Rivermead Mobility Index (MRMI) and Adapted Stroke Impact Scale (ASI) scores taken on admission, two weekly and on discharge. This service review will retrospectively evaluate if these inpatient therapy groups benefit psychological and motor recovery, in acute stroke rehabilitation patients. Rehabilitation begins as soon as life-saving treatment has been given and the patient is deemed medically stable. Rehabilitation if required continues within the unit up to a few months post stroke before referral on to other services. The patients included within this service review will be 24 hours to 3 months post-stroke. **Overarching research question:** Does attending additional inpatient CCT groups up to three times per week in addition to standard therapy for inpatient stroke patients at the Princess Royal hospital, influence motor function and psychological wellbeing scores and impact hospital length of stay. **Primary Objectives** • To compare psychological outcome scores for stroke patients (inpatients) at the Princess Royal hospital, attending stroke inpatient CCT groups versus standard therapy. • To compare motor outcome scores for stroke patients (inpatients) at the Princess Royal hospital, attending stroke inpatient CCT groups versus standard therapy.

Secondary objective:

- To compare length of stay for stroke patients (inpatients) at the Princess Royal hospital, attending stroke inpatient CCT groups versus standard therapy.

Scientific background (What is the scientific justification for the research? What is the background? Why is this an area of importance? Has similar research on this topic been done before? Have all existing sources of evidence, especially systematic reviews been fully considered? What new information will it provide?) **Should be no longer than 1 A4 page in length**, standard font as per handbook

Approximately 100,000 strokes occur every year with 1.3 million people living with the effects. The age of stroke onset is becoming younger with over one third or stokes occurring between the ages of 40 and 69 (Stroke association, 2025). Symptoms of a stroke include sudden weakness and/or sensory loss on one side of the body, visual changes, communication difficulties, loss of balance, dizziness and difficulties with higher executive functioning (Stroke association, 2025). A large population of stroke survivors have altered levels of independence and require ongoing support and rehabilitation to improve quality of life and function. Post-stroke changes in motor function can present as muscle weakness with the potential to reduce limb function, dexterity, co-ordination and stability (Intercollegiate Stroke Working Party (ISWP), 2023). Thereby limiting individuals' activity and participation in areas such as personal care, domestic tasks, work and family roles. Sitting ability, transfers, standing, walking, balance and upper limb function are goals often addressed within therapy.

Psychological changes post- stroke are common and can involve alterations to cognition, memory, mood, emotion and psychosocial adjustment (ISWP, 2023). NHS England National Stroke Service Model (2021) and the Integrated Community Stroke Service Model (2022) identified the importance of improvements in psychological care after stroke identifying an essential need for clinical psychologists within stroke teams to support the delivery of psychological care by the broader team (Intercollegiate Stroke Working Party, 2023). However, a review of the stroke workforce in 2023 found that in England only 14 out of 136 acute stroke units had at least one qualified clinical psychologist for every 30 stroke beds (Stroke Association, 2023). Identifying a need for psychological care to be delivered by the wider Stroke team, including physiotherapists, whilst psychologist input is unavailable.

Rehabilitation within the acute stroke and rehabilitation unit Princess Royal hospital (PRH) is delivered by stroke specialist physiotherapists, occupational therapists (OT), and speech and language therapists (SLT) with some dietetic input supported by therapy support workers (TSW). Data captured daily by the team is inputted into the sentinel stroke national audit programme (SSNAP) and provides feedback on the stroke team's performance against set measures including therapy and rehabilitation generally identifying a need for longer treatment sessions (SSNAP, 2024). And so, when the ISWP (2023) updated the guidance, increasing the recommended daily rehabilitation time to three hours of active therapy and six hours of activity at least five days a week, with no uplift in

resources, a review of current treatments and processes was necessary to develop ways of ensuring the delivery of quality therapy for longer sessions. The stroke therapy team at the PRH have introduced weekly circuit class therapy (CCT) groups delivering motor, psychological and communication sessions to increase patient therapy time and support psychological recovery. The groups aim to deliver treatments addressing individual goals guided by the SSNAP priorities of motor, psychological and communication input. Furthermore, incorporating the international classification of functioning, disability and health framework (ICF) providing task-based therapy to influence bodily structure and functions through altering the environment and encouraging activity and participation. (World Health Organisation, 2001).

Within current literature a small number of papers exist, (n=7), evaluating group therapy for the inpatient acute stroke population. McDonell et al's (2024) observational study evaluated the acute stroke population supporting the use of CCT as an alternative service delivery model for inpatient stroke rehabilitation. They reviewed the medical records of 110 stroke patients' who were receiving either individual therapy or CCT and identified that clinical implementation of CCT significantly increased therapy time whilst delivering functional gains equivalent to individual therapy. English et al (2015) identified CCT as effective for increasing therapy input time; however, walking outcomes remained the same as standard therapy.

Similar to McDonell et al (2024) and English et al (2015) this study will review the motor impact of CCT; however, it will build on this by incorporating psychological outcomes and length of stay. This original service review will differ further due to the patient cohort receiving individual therapy with between zero to three additional therapy groups per week. Locally this will provide evidence to guide ongoing group provision and explore a potential option to support psychological recovery whilst the support available at inpatient stroke units is limited. For the physiotherapists at the Princess Royal hospital, it will provide more structured evidence to be utilised when considering the use of group rehabilitation in the future. As a physiotherapist I am invested in trying to improve patient experience, psychological and functional status for my patients by using novel but effective treatments.

Study Design (please indicate the research methods which are appropriate) √	
Randomised controlled trial (RCT)	
Controlled trial without randomisation	
Case control study	
Cross sectional study	
Quasi experimental	
Before and after study	
Survey and/or interviews	
Cross over study	
Cohort	

Observational (ethnography)	
Audit	
Service Evaluation	√
Secondary data analysis	
Narrative review	
Systematic Review Or Meta analysis	
Other:	
If other, please give details:	

Detailed Plan of Investigation

Study setting (Name & description of centres: if it is a non Keele ensure any permission to use sites is included).
The service evaluation will be completed at the PRH in Telford, part of the Shrewsbury and Telford NHS Trust, alongside Keele University. This service review will evaluate anonymised data collected from the notes of patients on the Stroke and Rehab wards. The Wards consist of a 17 bedded acute stroke ward and a 25 bedded stroke rehabilitation unit. Data capture will utilise the help of Natalia Haycock (Highly Specialist Physiotherapist), Katie Alcorn (Specialist Physiotherapist) and the Stroke and Rehabilitation Therapy Team.

Will the study involve the recruitment of human participants?	No

Study population or equivalent for library-based studies
This service review will capture data from any patient receiving active treatment on the stroke and rehab unit at the PRH. **Inclusion Criteria** • Patients aged 18 years and over • Patients diagnosed with an acute stroke classified within the Bamford stroke classification as total anterior circulation stroke, partial anterior circulation stroke, lacunar syndrome, posterior circulation syndrome or haemorrhage. • Patients with a medical plan for active treatment **Exclusion Criteria** • Patients diagnosed with traumatic head injury • Patients on end-of-life care

- Patients presenting with decompensation of stroke - when symptoms of a previous stroke worsen due to the brain being out under pressure due to an infection or other stress on the brain.

How will potential research participants in the study be identified, approached and recruited? (give details for cases and controls separately if appropriate, describe sampling methodology and randomised procedures)

Recruitment of participants will not be required as this is a service review. Notes from acute stroke patients on the rehab ward in a set four-week period will be retrospectively reviewed. All adult patients for active treatment, who have been referred to physiotherapy, diagnosed with a stroke (as defined by Bamford stroke classification) within the last thirty days, will be included.

Will informed consent be obtained from research participants	No

Please give details of who will take consent, how it will be done and of any particular steps other than an information sheet taken to provide information e.g. video, interactive media. Please attach a copy of the consent form. If consent is not to be obtained, please explain why not

As a service review the data collected will be obtained from standard data capture (outcome measures) by the therapy team relating to group attendance and standard therapy. Initially data will be recorded against a patient number to keep multiple outcomes corresponding to the correct individual; once the data set is complete the patient number will be removed to anonymise the data. Specific consent will not be obtained as participants are not being recruited to the research, rather the data is being used to evaluate the current service provision. However, consent is obtained and documented by the treating therapists prior to attending each group or completing outcome measures as well as for each standard therapy session.

Summary of study (Please give brief synopsis/summary of methods and overview of the planned research should be no **longer than 2 sides of A4 page in length** but succinctness and clarity is good, standard font as per handbook. A flow chart/diagram should be attached where appropriate. It should be clear exactly what will happen to the research participants if applicable. **Note there are other sections addressing specific issues such as recruitment, analysis etc. DO NOT REPEAT.**

This retrospective service review will compare the clinical outcomes of acute stroke patients admitted to the stroke rehabilitation ward at PRH who received standard therapy compared to standard therapy plus additional therapy groups. The therapy professions providing the standard treatments and the group sessions

consist of physiotherapist, occupational therapists, speech and language therapists and therapy support workers.
The current service provides individualised therapy treatments consisting of the patient and one to three therapists and/or TSW's for approx. thirty to sixty minutes of treatment dependent on fatigue.
In addition to this, patients have the opportunity to attend specialist stroke rehabilitation groups targeting motor, communication or psychological development up to three times a week. Groups involve individual patient transfers into appropriate seating, relocation to the therapy gym for a 60-minute group therapy session prior to further transfers or mobility practice to return back to the bed space.
Patients are identified as appropriate medically and with the ability level for the group by the therapy team either the day before or the morning of the group. Each patient is individually approached prior to the group to be informed of the session plan and asked to consent to attend if they agree. Each individual can request to leave the group at any point and are accompanied back to the ward with the attended minutes documented accurately.
Groups are led by two therapists e.g. PT, OT or SLT and supported by one therapist or therapy support worker per three patients. Average group attendance is approx. fourteen patients.

Due to this being a service review of a current service no additional resources will be required. Clinical outcome measures are collected regularly as standard from initial assessment on admission through to discharge. This service review will collect and record anonymised outcomes at baseline, once a week, and at discharge. Data will be recorded anonymously on an encrypted spread sheet saved the hospital computer system and will only be analysed in anonymised form to ensure patient identity is protected.
Furthermore, recorded therapy data from clinical portal will be collected to capture the frequency and length of the standard therapy sessions attended and length of stay.

Data capture will include:

- Diagnosis and medical management plan to ensure the inclusion criterion is met.
- Age (years)
- Gender
- Number of groups attended per week/ over the four-week period, if any (sessions and length).
- Psychological recovery outcomes: Distress Thermometer (DT) and Adapted Stroke Impact Scale (ASI) scores taken on admission, two weekly and on discharge.
- Motor recovery outcomes: Modified Rivermead Mobility Index (MRMI) and Adapted Stroke Impact Scale (ASI) scores taken on admission, two weekly and on discharge
- The number of standard therapy sessions achieved (sessions and length)
- Length of stay (days).

A four-to-six-week period will be identified for data capture, which will be completed by the whole therapy team as part of the therapy group service provision aiming to collect thirty to fifty sets of data. Once collected statistical analysis will be performed on the recorded data to explore any relationships between the data sets.

Subject/Patient participation (Provide details of what research participants will do e.g. treatment intervention, completion of a questionnaire, participate in an in-depth interview. Please provide details of how the research procedures/intervention will be administered (include duration and audit details). Please provide details of any risks to the participant and safeguards to be put in place) (**DO NOT just repeat summary of study)**
Data will be evaluated from individuals who have participated in active rehabilitation following their stroke diagnosis either standard therapy or standard therapy and additional stroke rehabilitation groups. As per the standard service patients' psychological and functional outcome measures are assessed as elements of progression towards their treatment goals. This service evaluation has no perceived risk to the patients as it reviews the treatment they are receiving as a patient on the stroke and rehab unit. Safeguarding is always a concern of the staff on the ward and will concerns will continue to be identified, reported or appropriately referred as necessary.

Follow up (please provide details of follow up procedures and time points if appropriate)
The final data point will be at discharge due to standard therapy and the stroke therapy groups ending within the unit and care being transferred to community teams.

Outcome measures (if appropriate)
Primary Outcome Standardised psychological outcome measures (DT & ASI) Standardised functional outcome measure (MRMI & ASI) **Secondary Outcome** Length of stay

4. Data Analysis

Has the size of the study been informed by a formal statistical power calculation	NO
If yes, indicate the basis upon which this was done, covering the areas shown, and giving sufficient information to allow the replication of the calculation	

If no, explain how the size of the study was determined and why a formal sample size calculation is not required

As this is a service review, a sample size calculation is not required. However, the study size required has been determined by considering the average number of patients moving through the stroke service per month and setting an achievable number of data sets that can be collected within the time frame available for the project. Based on this the service review will aim to capture thirty to fifty sets of data.

Describe and justify the methods of analysis (identifying specific procedures in the case of statistical analysis or analytical methods in the case of qualitative research) (**DO NOT just repeat summary of study)**

This quantitative data will be analysed initially using descriptive statistics to gain the mean, median and standard deviation for each group before using inferential statistics for between group analysis.
Due to the data being ordinal, Mann-Whitney-U tests will be used to compare scores between groups. Further statistical analysis may be required dependent on the findings.

Group Analysis

- Between group analysis comparing psychological outcome measure scores of patients receiving standard therapy and patients attending additional CCT groups.
- Between group analysis comparing psychological outcome measure scores of patients attending one, two and three CCT groups per week
- Between group analysis comparing motor outcome measure scores of patients receiving standard therapy and patients attending additional CCT groups
- Between group analysis comparing motor outcome measure scores of patients attending one, two and three CCT groups per week
- Between group analysis comparing the length of stay for patients receiving standard therapy and patients attending additional CCT groups
- Between group analyses comparing the length of stay for patients attending one, two and three CCT groups per week.

Other than your supervisor has any additional statistical or methodological support or advice been sought and given?

Not currently

Where will analysis of the data from the study take place and by Whom will it be undertaken?

Anonymised data will be encrypted and analysed by myself Emily Farla on my personal password protected laptop with support from my supervisor.

5. Timetable (Flow chart Appendix 1)

Start Date	April 2025
End Date	June 2025
Duration	3 months

Attachments- Not all may be applicable

	Tick
Timetable Flow chart	√
Full SPEC form for non-Library based studies	√
SPEC Notification for Library based studies	
Consent form(s)	
Information sheet(s)	
Recruitment posters, emails etc.	
Health Screening questionnaire	
Interview guidelines	
Questionnaire	
Letter of support from manager	√
R & D documentation	√
Permissions	
Any other	

Once completed and the appropriate supervisor approval has been obtained: -

Submit via the 'Full proposal submission' folder via the KLE module, Assessments page.

N.B. It is the student's responsibility to ensure that all paperwork is complete and handed in on time. If the RESEARCH PROPOSAL FORM is incomplete in anyway and if the supervisor approved SPEC/SPEC Notification and all appendices are not included this proposal will not be formally reviewed and your progress may be delayed.

Dr Alison Rogers

PG Dissertation Module-lead

The School of Allied Health Professions acknowledges that this form is based on Keele University Peer Review application form for student research projects for taught courses.

References

- English, C. Bernhardt, J. Crotty, M. Esterman, A. Segal, L. and Hillier, S. (2015) 'Circuit class therapy or seven-day week therapy for increasing rehabilitation intensity of therapy after stroke (CIRCIT): a randomised controlled trial', *World Stroke Organisation*, 10, pp. 594-602. Available at: https://journals.sagepub.com/doi/epub/10.1111/ijs.12470 (Accessed 21/03/2025).
- Intercollegiate Stroke Working Party (2023) *National Clinical Guideline for Stroke for the UK and Ireland*. Available at: www.strokeguideline.org (Accessed 18/03/2025).
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Appendix 9 Student Project Ethics Committee (SPEC) Application

School of Pharmacy & Allied Health Professions

Student Project Ethics Committee (SPEC) application form – postgraduate

INFORMATION FOR THE APPLICANT

This application form is for use by postgraduate students (*not* undergraduate or preregistration masters students) and **must be:**

- completed for research involving human participants or human tissue
- authorised by your supervisor *before* submission

and accompanied (where appropriate) by the following documents:

- recruitment posters and/or emails etc.
- participant information sheet (see template on the KLE)
- consent form (see template on the KLE)
- letter(s) of invitation, questionnaires, interview schedule, relevant permissions etc.

All of the above must be submitted as a single pdf. Your research proposal is *not* required and should not be included.

All documents must be presented in full in the submitted application, not in the form of links to external files on One Drive or similar.
Make sure that you read the current **SPEC Guidance Document** on the KLE in conjunction with completing this form. There is also guidance in the form itself, in violet font.

This application and any accompanying documents will be reviewed by the School of Pharmacy & Allied Health Professions Student Project Ethics Committee (SPEC).
For deadlines and dates of meetings see the KLE (KLE/Learning/Student Projects Ethics Committee).

Please note that it is your responsibility to follow the University's Code of good research practice http://www.keele.ac.uk/researchsupport/researchgovernance/ and any relevant academic or professional guidelines in the conduct of your study. This includes providing appropriate information sheets and consent forms, and ensuring confidentiality in the storage and use of data. If the research activity stated in this application is approved, you are required to adhere to the approved study procedures. If you wish to make any significant changes to the question, design or conduct of this study you are required to seek further approval from the SPEC. If any adverse reactions/events take place during the course of the research you are required to report it to the Chair of SPEC immediately (contact Julius Sim).

Ethical approval must be obtained *before* potential participants are approached to take part in any research.

This form does not need to be completed for library-based studies.

Note: the checkboxes in the form can be selected simply by clicking on them, if you click in error, click again and the box will be unchecked.

School of Pharmacy & Allied Health Professions

Student Project Ethics Committee (SPEC) application form – postgraduate

Section A – Applicant and project details

Project title	Evaluation of standard therapy and additional inpatient physiotherapy groups on functional ability, self-reported psychological scales and length of stay (LOS) in acute stroke patients: A service review of current provision.
Name of researcher	Emily Farla
Programme of study	Advanced Physiotherapy in Neurology
Keele e-mail address	X6a39@students.keele.ac.uk
Type of application	Postgraduate taught student
Name of supervisor(s)	**Alison Rogers**

For a group project, duplicate this box and complete it for each student

Type of application (tick/untick as appropriate)	A first application ☒	A revised application ☐

Section B – Project details

B1	In lay terms, provide a *brief* summary of the project including the background and rationale for the proposed research and the research question(s) or hypothesis(es) **(max 300 words).** Following the release of the updated stroke guidelines by the Intercollegiate Stroke Working Party in 2023 the recommended daily rehabilitation time increased to three hours of active therapy and six hours of activity at least five days a week. With no uplift in resources, a review of current treatments and processes was necessary to develop

	ways of ensuring the delivery of quality therapy for longer sessions. The stroke therapy team at the Princess Royal hospital developed weekly motor, psychological and communication therapy groups focusing on increasing quality therapy time and goal achievement. This service review will retrospectively evaluate if these newly implemented groups benefit psychological and motor recovery in acute stroke rehabilitation patients. Patient and staff feedback since implementation indicates those attending groups demonstrate improved mood, function and motivation. With this feedback being anecdotal and self-reported, it is unclear if this is perceived or translates in to a measurable improvement via standardised outcome measures. The service review aims to evaluate the psychological and motor impact on stroke patients attending therapy groups in addition to regular therapy sessions. Principle question: Does attending additional stroke therapy groups up to three times per week in addition to standard therapy for inpatient stroke patients influence motor function and psychological wellbeing scores and impact hospital length of stay. Primary Objectives • To retrospectively measure the effect on psychological outcome scores for stroke patients (inpatients) attending stroke therapy groups, up to three times a week, in addition to standard therapy. • To retrospectively measure the effect on motor outcome scores for stroke patients (inpatients) attending stroke therapy groups, up to three times a week, in addition to standard therapy. Secondary objective: • To retrospectively measure the effect on length of stay for stroke patients (inpatients) attending stroke therapy groups, up to three times a week, in addition to standard therapy.

B2	**Indicate the study design (tick more than one box, if applicable)**	
	Randomized trial	☐
	Other experimental study	☐
	Quasi-experimental study (e.g. cohort study, case-control study)	☐
	Case study or *n*=1 study	☐
	Laboratory study	☐
	Survey	☐
	Interview/focus group study	☐

	Observational study	☐
	Audit/service evaluation	☒
	Other (give details below)	☐

B3	Give further details of the design and methods to be employed **(max 500 words).** If your research project involves a phased approach, each phase can be applied for separately. Diagrams or flow charts that would aid clarification of the research should be attached if appropriate (these attachments will not be included in the word count). Remember to attach any questionnaires or interview topic guides. This retrospective service review will compare the clinical outcomes of acute stroke patients admitted to the stroke rehabilitation ward at Princess Royal hospital who received standard therapy compared to standard therapy plus additional therapy groups. The therapy professions providing the standard treatments and the group sessions consist of physiotherapists, occupational therapists, speech and language therapists and therapy support workers (TSW). The current service provides individualised therapy treatments consisting of the patient and one to three therapists and/or TSW's for approx. thirty to sixty minutes of treatment dependent on fatigue approx. four days out of seven. In addition to this patients have the opportunity to attend specialist stroke rehabilitation groups targeting motor, communication or psychological development up to three times a week. Groups involve individual patient transfer or mobility practice into appropriate seating, relocation to the therapy gym for a 60-minute group therapy session prior to further transfers or mobility practice to return back to the bed space. Patients are identified as appropriate both medically and ability level for the group by the therapy team either the day before or the morning of the group. Each patient is individually approached prior to the group to be informed of the session plan and asked to consent to attend if they agree. Each individual can request to leave the group at any point and are accompanied back to the ward with the attended minutes documented accurately. Groups are led by two therapists e.g. PT, OT or SLT and supported by one therapist or therapy support worker per three patients. Average group attendance is approx. fourteen patients. Due to this being a service review of a current service no additional resources will be required. Clinical outcome measures are collected regularly as standard from initial assessment on admission through to discharge. The outcomes collected will be recorded at baseline, every two weeks and at discharge to assess psychological

	recovery (distress thermometer (DT)) and motor recovery (modified rivermead mobility index (MRMI) and adapted stroke impact (ASI) scale scores). Furthermore, recorded therapy data from clinical portal will be collected to capture standard therapy sessions and length of stay. Data capture will include: • Diagnosis and medical management plan to ensure the inclusion criterion is met. • Age • Sex • Number of groups attended per week/ over the four-week period if any • MRMI, DT and ASI scores (taken on admission, two weekly and on discharge), • The number of standard therapy sessions achieved • Length of stay A four-to-six-week period will be identified for data capture, which will be completed by the whole therapy team including myself as part of the therapy group service provision aiming to collect thirty to fifty sets of data. Data will be recorded anonymously on an encrypted spread sheet saved the hospital computer system and will only be analysed in anonymised form to ensure patient identity is protected. Once data collection is complete statistical analysis will be performed to explore relationships between the data sets.

B4	Describe the characteristics of the participant group, and the inclusion and exclusion criteria. If there are no participants in this study (e.g. secondary analysis of previously collected data), write 'Not applicable'. Participants will not actively be recruited for this service evaluation as standardly collected data will be retrospectively reviewed. The data set for this review will include patients who have been on active treatment on the stroke and rehab unit at the princess royal hospital and who meet the inclusion criteria as below. **Inclusion Criteria** • 18 and over • Patients diagnosed with an acute stroke including total anterior circulation stroke, partial anterior circulation stroke, lacunar syndrome, posterior circulation syndrome or haemorrhage. **Exclusion Criteria** • Under 18's • Traumatic head injury • Patients receiving end of life care • Patients declining all therapy input • Decompensation of stroke- when symptoms of a previous stroke worsen due to the brain being out under pressure due to an infection or other stress on the brain.

Section C – Issues of risk or of an ethically sensitive or challenging nature

C1	Will the research require Human Tissue Act (HTA) approval (research involving deceased persons, body parts, or the storage of other human elements such as blood, hair or tissue samples, including saliva and waste products)? Yes ☐ No ☒
C2	**If yes**, have you discussed your application with the HTA officer Yes ☐ No ☐ If you have discussed it, give the date on which this discussion took place:

C3	**If yes**, have you submitted your HTA application? Yes ☐ No ☐ If you have submitted it, give the reference number: Ensure that you complete the above questions in liaison with your supervisor. Guidance on the relevant stipulations of the Human Tissue Act can be accessed via https https://www.hta.gov.uk/guidance-professionals/licences-roles-and-fees/licensing/do-i-need-hta-licence

C4	Will the research involve administrative or controlled data that requires permission from appropriate authorities for access to and use of dataset(s)? Yes ☐ No ☒
C5	Will the research involve visual/oral research methods where participants or others may be identified? Yes ☐ No ☒
C6	If yes, explain in E3 below how issues relating to anonymity will be dealt with. Will the research involve raising issues of a sensitive nature where individuals are required to reveal personal information about matters such as their personal lives, illegal behaviour, sexual orientation, etc? Yes ☐ No ☒
C7	Will the research involve the administration of substances to participants or will the research involve invasive, intrusive or potentially harmful procedures of any kind? Yes ☐ No ☒
C8	Are there any potential risks to participants and members of the research team that involve more than minimal levels of risk of harm or discomfort (including physical harm, psychological or emotional distress)? Yes ☐ No ☒
C9	

C10	Will the research involve access to, collection of, and/or storage of materials that: Are covered by the Official Secrets Act or Terrorism Act? Yes ☐ No ☒ Are commissioned by the military? Yes ☐ No ☒ Are commissioned under an EU security call? Yes ☐ No ☒ Involve the acquisition of security clearances? Yes ☐ No ☒ Concern terrorist or extreme groups? Yes ☐ No ☒ If you have ticked yes to any question in C10 you are asked register your project with the University via https://www.keele.ac.uk/research/raise/governanceintegrityandethics/securitysensitiveinformation/ The University supports its researchers in undertaking research using security sensitive material (ie the above categories) but takes seriously the need to protect them from the misinterpretation of intent by the authorities. Therefore, registration of research enables the University to have oversight and demonstrate to authorities that it is aware of the research being carried out.

C11	Will the research have potential safety risks for members of the research team? Yes ☐ No ☒
C12	Will the research involve members of the public *in a researcher capacity* (e.g. if they are involved in research data collection or data analysis, as opposed to being participants)? Yes ☐ No ☒
C13	**For all applications,** outline all potential risks to participants and members of the research team and the measures that will be taken to minimise risk; and the procedures that will be adopted in the event of an adverse event.

	This is a low-risk project as it is collecting retrospective data and is not making any alterations to standard practice. The University's Lone Working Policy can be accessed via http://www.keele.ac.uk/dohs/a2z/loneworking/

C14	Will the research be undertaken overseas? Yes ☐ No ☒
C15	**a) If yes,** have you consulted the foreign and commonwealth office website for guidance/travel advice and is it safe to travel there? Yes ☐ No ☐
C16	**b) If yes,** have you completed and submitted a risk assessment form? Yes ☐ No ☐
C17	**c) If yes**, are you aware of the political sensitives and issues of local practice in the region where the research will be carried out? Yes ☐ No ☐
C18	**If yes to C17**, outline the details and how these issues will be addressed: Foreign and Commonwealth Office travel advice website: https://www.gov.uk/foreign-travel-advice Overseas Travel Policy and risk assessment form (covers both Staff and PGR students) is available from http://www.keele.ac.uk/finance/insurance/travelinsurance/travellingoverseas-policyriskassessment/

C19	Will the research involve vulnerable groups, i.e. children or adults with a learning disability or individuals with cognitive impairment or those in an unequal relationship with you, where the ability to provide autonomous consent may be diminished? Yes ☐ No ☒ If yes, explain fully in Section D3 below how you will ensure that appropriate consent to participate in this study will be obtained from these participants and, in Section C13 above, how any risk of harm specific to these participants will be handled.

C20	Will participants be deceived in any way as part of the study? Yes ☐ No ☒ **If yes**, describe the nature and extent of deception involved, including where appropriate how and when this deception will be revealed and who will administer this feedback (debrief).

SECTION D – Recruitment & consent process

D1	Will the co-operation of a gate keeper be required for initial access to the study population to be recruited (e.g. employees, school children)? Yes ☒ No ☐
D2	Will other students be recruited as participants in the study? Yes ☐ No ☒ If yes, see the guidance in Section 1 of the SPEC guidance document and explain in D3 below how you will adhere to this guidance.
D3	Indicate how potential participants will be identified, approached and recruited and outline any relationship between the researcher and potential participant. Participants will not be actively recruited to the service review and data will be reviewed in retrospect. The data will be synthesised by a member of the therapy team however; the data will be anonymised prior to synthesis Remember to attach copies of posters, advertisements, invitation letters/e-mails to be used as part of the recruitment process with version numbers included in the footer.

D3	Describe the process that will be used to seek and obtain informed consent. Informed consent is obtained at the point of attending therapy groups of standard therapy sessions by the treating therapist. The individual can leave treatment and groups sessions at any time by communicating their wish to do so. Due to the anonymity and retrospective data collection specific informed consent will not be obtained. Remember to attach your information sheet and consent form with versions numbers & date included in the footer. Templates available from the SPEC KLE page.

D4	Will consent be sought to use the data for other research? Yes ☐ No ☒
D5	Will consent be sought to contact the individual to participate in future research? Yes ☐ No ☒

D6	Can participants withdraw from the research? Yes ☐ No ☒
D7	**If yes**, state up to what point participants are able to withdraw from the research
D8	**If yes**, outline how participants will be informed of their right to withdraw, how they can do this and
D9	**If yes,** what will happen to their data if they withdraw?
D10	**If no**, explain why they cannot withdraw (e.g. anonymous survey).

	Anonymous review of a current service Remember that if data are collected anonymously, the participant, and his or her data, cannot be withdrawn after the data have been submitted.

SECTION E – Confidentiality and anonymity

E1	Will the research involve recruitment of participants via social media? Yes ☐ No ☒ If yes, see the guidance in Section 2 of the SPEC Guidance Document and indicate in E3 how you will adhere to this guidance.
E2	Will the research involve interviews and/or focus groups Yes ☐ No ☒ If yes, see the specific requirements regarding data collection in Section 4 of the KLE Guidance Document and indicate in E3 below how you will adhere to this guidance.
E3	Outline the procedures that will be used to protect, as far as possible, the anonymity of participants and/or confidentiality of data during the conduct of the research and in the release of its findings. See the guidance regarding the anonymity of data in Section 3 of the SPEC Guidance Document. Data is collected as standard by the ward team initially with a patient identifiable number to record how many group sessions and standard therapy sessions are attended, this is required to be recorded within the hospital data capture system clinical portal and the nationwide sentinel stroke national audit programme. Data is stored securely in locked offices and on password protected trust computers. Once data capture is complete it will be anonymised by removing the patient identifiable number. Data will not be synthesised until all patient identifiable information has been removed. During the write up of the findings the data will remain anonymised.

SECTION F – Storage, access to, management of, and disposal of data

F 1	Will the research involve data that require permission from appropriate authorities for access to and use of such data? Yes ☐ No ☐
F 2	

F 3	Will the research involve access to records of personal or sensitive confidential information? Yes ☒ No ☐
F 4	Will the research involve the sharing of data or confidential information beyond the initial consent given? Yes ☐ No ☒
	For all applications, describe the research data that will be stored; any necessary permissions to access the data that have been, or will be, obtained; where the data will be stored and for how long; the measures that will be put in place to ensure the security of data; the extent to which the data will be either anonymous or anonymized; who will have access to the data; long term data management plans following completion of the project; and how/when data will be disposed of. Permission from the stroke therapy team and management to access the data has been granted to complete the service review. Initial data will be collected as normal using the trusts data capture system clinical portal as well as vis the sentinel stroke national audit programme. Once complete patient identifiable information will be removed and replaced with data set numbers. No record of the patients the data refers to will be kept by the service review. Anonymised data will be encrypted and stored on a password protected hospital trust computer. For data analysis the encrypted anonymised data will be sent by NHS email to my personal password protected laptop. The anonymised data will only be accessible by me. Following completion and marking of the project all data collected for the service review will be destroyed from both the hospital computer and my personal computer. If you are accessing or storing research material that is considered to be security-sensitive you will need to register your project with University. More information about security sensitive research material and the registration process can be accessed via https://www.keele.ac.uk/research/raise/governanceintegrityandethics/securitysensitiveinformation

SECTION G - Other ethical issues raised by the research

G1	Are there any other ethical issues that may be raised by the research? Yes ☐ No ☒
G2	If yes, please give details:
G3	Is there any aspect of the research that could potentially have a negative effect on the reputation of the University (such as receiving controversial sources of funding, engaging with issues that may cause offence to groups or individuals, or engaging in areas that might be misconstrued as endorsing illegal practices)? Yes ☐ No ☒
G4	If yes, please give details:

SECTION H - Other approvals required

H1	Does the project require the researcher(s) to have a Disclosure and Barring Service (DBS) check? (this would be required if carrying out research involving contact with children or vulnerable adults) Yes ☐ No ☒
H2	**If yes**, have you attached a confirmation of satisfactory DBS check memo? Yes ☐ No ☐
H3	Does the project require National Offender Management Service (NOMS) approval? Yes ☐ No ☒
H4	

H5	Does the project require Health Research Authority (HRA) Approval? Yes ☐ No ☒ (see https://www.hra-decisiontools.org.uk/ethics/)
H6	Does the project require approval from another organisation? Yes ☒ No ☐
H7	If you have ticked yes to any of the above, you need to submit evidence that the appropriate approval has been granted.
H8	Are you working on data from a study that has previously received approval from an NHS (NRES) or similar ethics committee? Yes ☐ No ☒ **If yes, p**lease quote the reference number for the approval here: Attach as a pdf, or paste below as text or a screenshot, a letter or email from your supervisor (or whoever provided the data, if other than your supervisor) confirming that the original consent covers your intended use of the data.

SECTION I – Supervisor approval

I1	Has your supervisor reviewed and approved this application as appropriate to be submitted? This is a mandatory requirement for an *initial submission* or a *complete resubmission*. Yes ☐ No ☐ **If yes**, provide evidence of this approval. You can do this by attaching a pdf of the email from your supervisor to your application or inserting the text, or a screenshot, of the email here. You do *not* need to obtain fresh evidence of supervisor approval if submitting for *chair's action*, but you should still consult your supervisor about your resubmission.

SECTION J – Checklist

J1	**Please list the documents attached to this application**		
	Document	Version number	Date
	Letter from Manager		
	Evidence of R&D approval		

The following are ***not*** required:

- Research proposal
- Gannt chart

Your application to SPEC must be on the up-to-date documentation downloadable from the SPEC page on the KLE at the time of applying to SPEC. Your supervisor must approve your application – see section I1 above.

Appendix 10 Student Project Ethics Committee Approval

Dear Emily Farla

Project title: Evaluation of inpatient physiotherapy groups on functional ability, self-reported psychological scales and length of stay (LOS) in acute stroke patients: A service review of current provision at the Princess Royal hospital

Supervisor: Alison Rogers

I am pleased to inform you that your application has received a favourable opinion from the School of Pharmacy and Allied Health Professions Student Project Ethics Committee. Please note the version number and dates for all documentation you stated in the checklist of your SPEC application form; only the documents you specified have been approved by the committee. Note also that SPEC has reviewed your application from an ethical, not a methodological, perspective; the latter is the responsibility of your supervisor.

This favourable opinion is based on the description of your study in the SPEC application form. You are therefore required to adhere to the study procedures described therein and use the documentation (specified dates and version number) contained in your application. If there are any amendments to your study, or you intend to carry out procedures in a way that is not reflected in the SPEC application form, you are required to seek further approval from SPEC, through the KLE.

Please note it is your responsibility to follow the University's policies on research ethics (https://www.keele.ac.uk/research/raise/governanceintegrityandethics/researchethics/) and any relevant academic or professional guidelines in the conduct of your study.

If any adverse reactions or events take place during your project, please report this to the Chair of SPEC immediately (Dr Gary Moss, g.p.j.moss@keele.ac.uk). If you have any queries, please visit the SPEC KLE space for further information and/or contact Gary Moss.

Although no changes are required to your study before you proceed, one or more suggestions have been noted in your application. For example, all the comments highlighted in yellow in your last submission should be checked and corrected. When this is done please return a copy of this form to me.

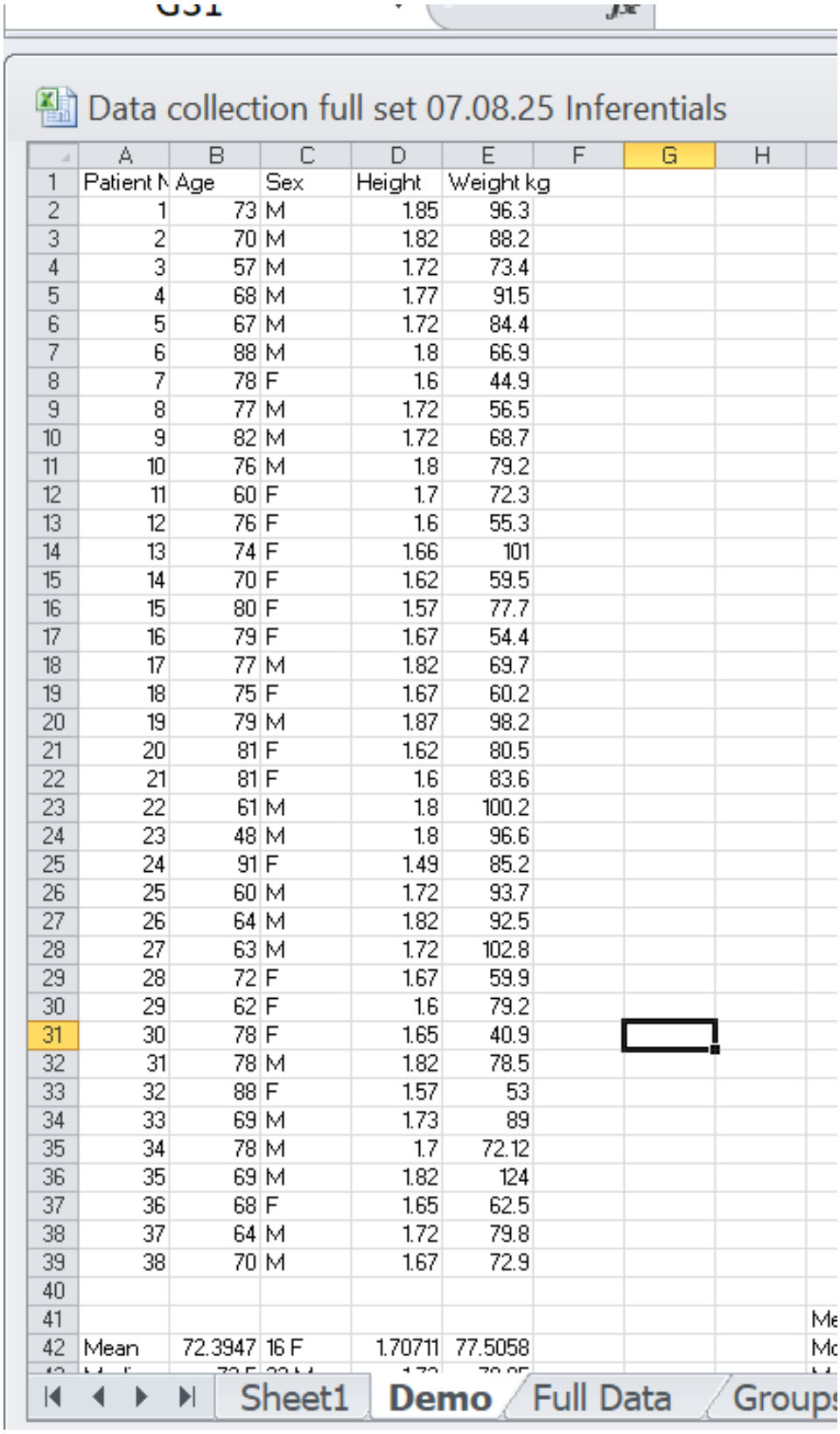
Good luck with your project.

Best wishes,

Gary Moss

Chair, School of Allied Health Professions and Pharmacy Student Project Ethics Committee

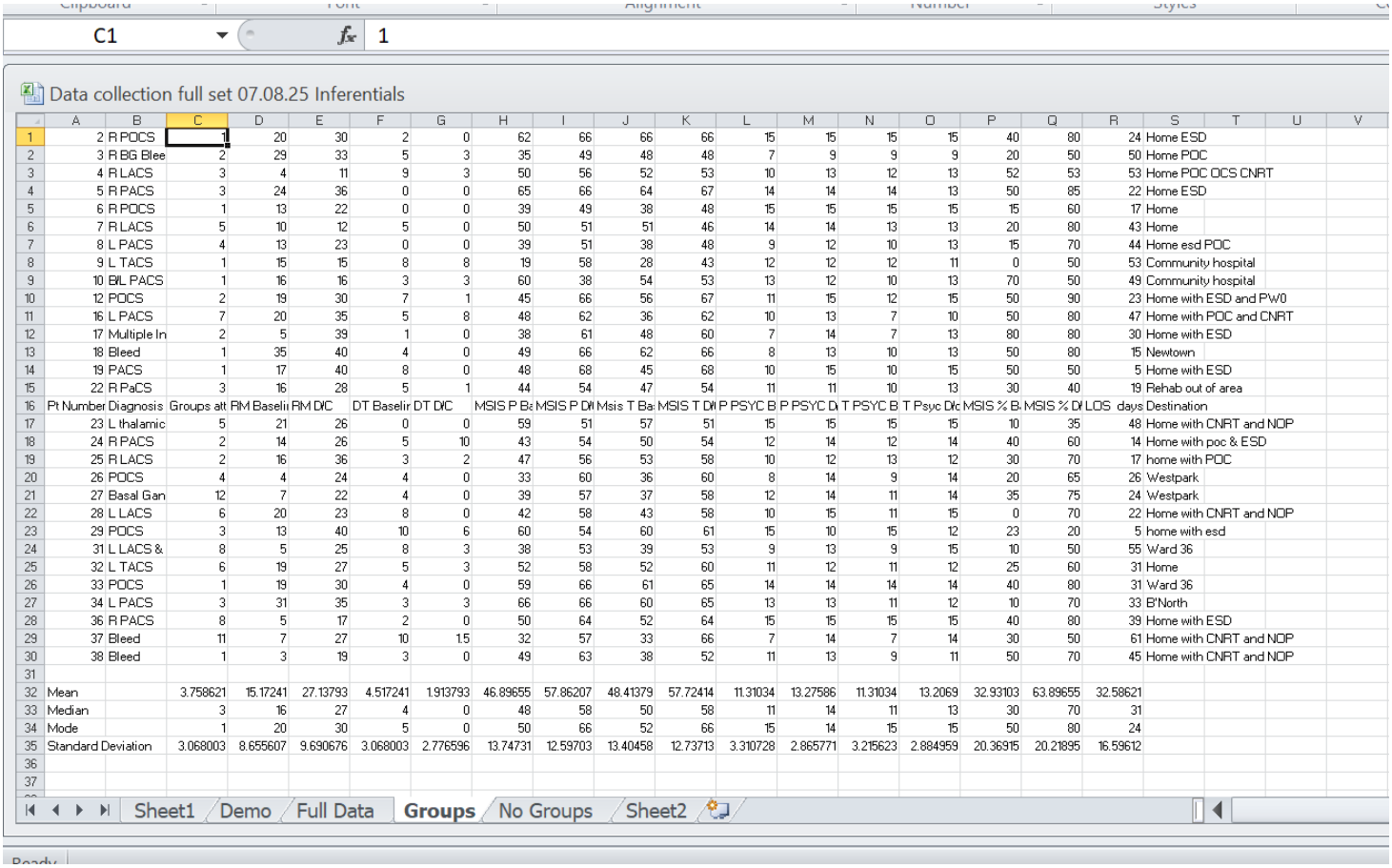
Appendix 11 Excel data input



Data collection full set 07.08.25 Inferentials

	A	B	C	D	E	F	G	H
1	Patient N	Age	Sex	Height	Weight kg			
2	1	73	M	1.85	96.3			
3	2	70	M	1.82	88.2			
4	3	57	M	1.72	73.4			
5	4	68	M	1.77	91.5			
6	5	67	M	1.72	84.4			
7	6	88	M	1.8	66.9			
8	7	78	F	1.6	44.9			
9	8	77	M	1.72	56.5			
10	9	82	M	1.72	68.7			
11	10	76	M	1.8	79.2			
12	11	60	F	1.7	72.3			
13	12	76	F	1.6	55.3			
14	13	74	F	1.66	101			
15	14	70	F	1.62	59.5			
16	15	80	F	1.57	77.7			
17	16	79	F	1.67	54.4			
18	17	77	M	1.82	69.7			
19	18	75	F	1.67	60.2			
20	19	79	M	1.87	98.2			
21	20	81	F	1.62	80.5			
22	21	81	F	1.6	83.6			
23	22	61	M	1.8	100.2			
24	23	48	M	1.8	96.6			
25	24	91	F	1.49	85.2			
26	25	60	M	1.72	93.7			
27	26	64	M	1.82	92.5			
28	27	63	M	1.72	102.8			
29	28	72	F	1.67	59.9			
30	29	62	F	1.6	79.2			
31	30	78	F	1.65	40.9			
32	31	78	M	1.82	78.5			
33	32	88	F	1.57	53			
34	33	69	M	1.73	89			
35	34	78	M	1.7	72.12			
36	35	69	M	1.82	124			
37	36	68	F	1.65	62.5			
38	37	64	M	1.72	79.8			
39	38	70	M	1.67	72.9			
40								
41								Me
42	Mean	72.3947	16 F	1.70711	77.5058			Mo

Sheet1 | Demo | Full Data | Groups



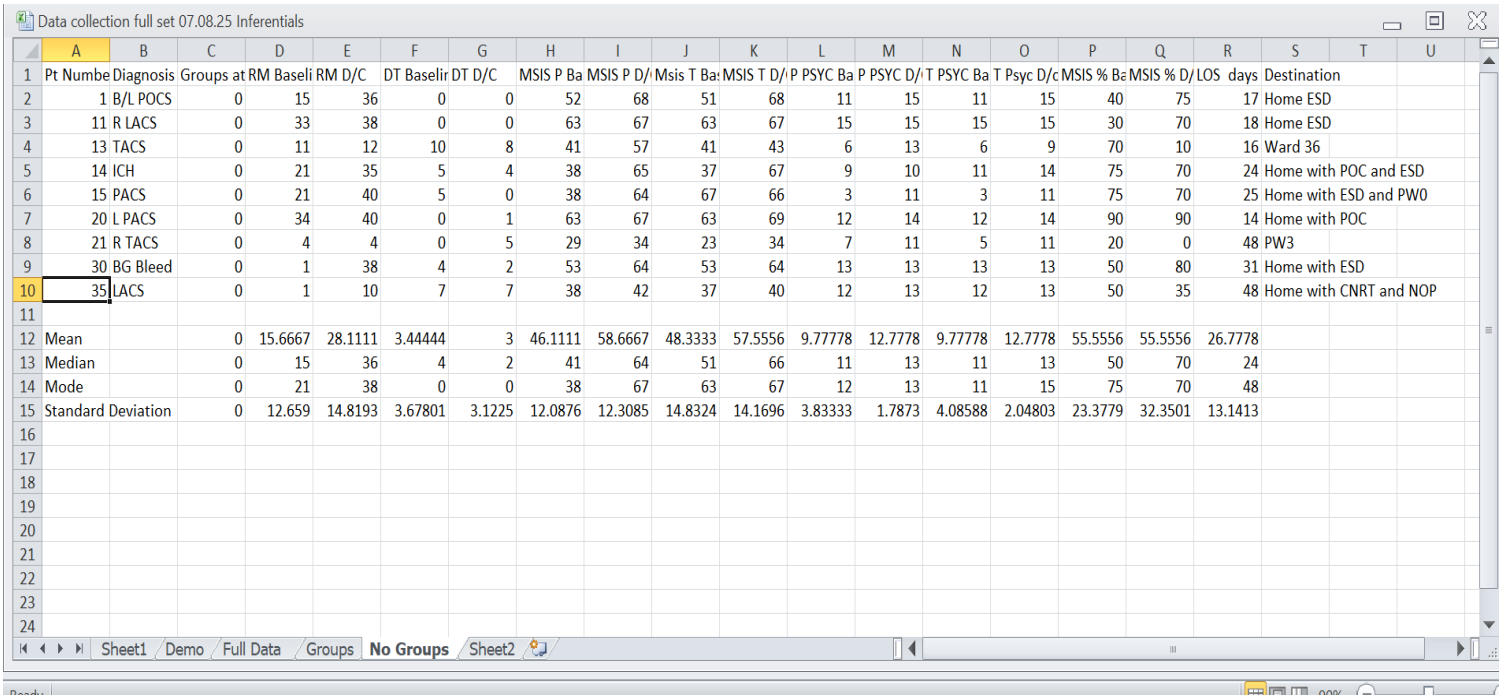
C1 | 1

Data collection full set 07.08.25 Inferentials

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	2	R POCS	1	20	30	2	0	62	66	66	66	15	15	15	15	40	80	24	Home ESD			
2	3	R BG Blee	2	29	33	5	3	35	49	48	48	7	9	9	9	20	50	50	Home POC			
3	4	R LACS	3	4	11	9	3	50	56	52	53	10	13	12	13	52	53	53	Home POC OCS CNRT			
4	5	R PACS	3	24	36	0	0	65	66	64	67	14	14	14	13	50	85	22	Home ESD			
5	6	R POCS	1	13	22	0	0	39	49	38	48	15	15	15	15	15	60	17	Home			
6	7	R LACS	5	10	12	5	0	50	51	51	46	14	14	13	13	20	80	43	Home			
7	8	L PACS	4	13	23	0	0	39	51	38	48	9	12	10	13	15	70	44	Home esd POC			
8	9	L TACS	1	15	15	8	8	19	58	28	43	12	12	12	11	0	50	53	Community hospital			
9	10	B/L PACS	1	16	16	3	3	60	38	54	53	13	12	10	13	70	50	49	Community hospital			
10	12	POCS	2	19	30	7	1	45	66	56	67	11	15	12	15	50	90	23	Home with ESD and PW0			
11	16	L PACS	7	20	35	5	8	48	62	36	62	10	13	7	10	50	80	47	Home with POC and CNRT			
12	17	Multiple In	2	5	39	1	0	38	61	48	60	7	14	7	13	80	80	30	Home with ESD			
13	18	Bleed	1	35	40	4	0	49	66	62	66	8	13	10	13	50	80	15	Newtown			
14	19	PACS	1	17	40	8	0	48	68	45	68	10	15	10	15	50	50	5	Home with ESD			
15	22	R PaCS	3	16	28	5	1	44	54	47	54	11	11	10	13	30	40	19	Rehab out of area			
16	Pt Number	Diagnosis	Groups att	RM Baseli	RM D/C	DT Baselir	DT D/C	MSIS P Ba	MSIS P Dl	Msis T Ba	MSIS T Dl	P PSYC B	P PSYC D	T PSYC B	T Psyc D/c	MSIS % B	MSIS % Dl	LOS days	Destination			
17	23	L thalamic	5	21	26	0	0	59	51	57	51	15	15	15	15	10	35	48	Home with CNRT and NOP			
18	24	R PACS	2	14	26	5	10	43	54	50	54	12	14	12	14	40	60	14	Home with poc & ESD			
19	25	R LACS	2	16	36	3	2	47	56	53	58	10	12	13	12	30	70	17	home with POC			
20	26	POCS	4	4	24	4	0	33	60	36	60	8	14	9	14	20	65	26	Westpark			
21	27	Basal Gan	12	7	22	4	0	39	57	37	58	12	14	11	14	35	75	24	Westpark			
22	28	L LACS	6	20	23	8	0	42	58	43	58	10	15	11	15	0	70	22	Home with CNRT and NOP			
23	29	POCS	3	13	40	10	6	60	54	60	61	15	10	15	12	23	20	5	home with esd			
24	31	L LACS &	8	5	25	8	3	38	53	39	53	9	13	9	15	10	50	55	Ward 36			
25	32	L TACS	6	19	27	5	3	52	58	52	60	11	12	11	12	25	60	31	Home			
26	33	POCS	1	19	30	4	0	59	66	61	65	14	14	14	14	40	80	31	Ward 36			
27	34	L PACS	3	31	35	3	3	66	66	60	65	13	13	11	12	10	70	33	B'North			
28	36	R PACS	8	5	17	2	0	50	64	52	64	15	15	15	15	40	80	39	Home with ESD			
29	37	Bleed	11	7	27	10	1.5	32	57	33	66	7	14	7	14	30	50	61	Home with CNRT and NOP			
30	38	Bleed	1	3	19	3	0	49	63	38	52	11	13	9	11	50	70	45	Home with CNRT and NOP			
31																						
32	Mean		3.758621	15.17241	27.13793	4.517241	1.913793	46.89655	57.86207	48.41379	57.72414	11.31034	13.27586	11.31034	13.2069	32.93103	63.89655	32.58621				
33	Median		3	16	27	4	0	48	58	50	58	11	14	11	13	30	70	31				
34	Mode		1	20	30	5	0	50	66	52	66	15	14	15	15	50	80	24				
35	Standard Deviation		3.068003	8.655607	9.690676	3.068003	2.776596	13.74731	12.59703	13.40458	12.73713	3.310728	2.865771	3.215623	2.884959	20.36915	20.21895	16.59612				
36																						
37																						

Sheet1 | Demo | Full Data | **Groups** | No Groups | Sheet2

Ready



Data collection full set 07.08.25 Inferentials

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	Pt Numbe	Diagnosis	Groups at	RM Baseli	RM D/C	DT Baselir	DT D/C	MSIS P Ba	MSIS P D/	Msis T Ba	MSIS T D/	P PSYC Ba	P PSYC D/	T PSYC Ba	T Psyc D/c	MSIS % Ba	MSIS % D/	LOS days	Destination			
2	1	B/L POCS	0	15	36	0	0	52	68	51	68	11	15	11	15	40	75	17	Home ESD			
3	11	R LACS	0	33	38	0	0	63	67	63	67	15	15	15	15	30	70	18	Home ESD			
4	13	TACS	0	11	12	10	8	41	57	41	43	6	13	6	9	70	10	16	Ward 36			
5	14	ICH	0	21	35	5	4	38	65	37	67	9	10	11	14	75	70	24	Home with POC and ESD			
6	15	PACS	0	21	40	5	0	38	64	67	66	3	11	3	11	75	70	25	Home with ESD and PW0			
7	20	L PACS	0	34	40	0	1	63	67	63	69	12	14	12	14	90	90	14	Home with POC			
8	21	R TACS	0	4	4	0	5	29	34	23	34	7	11	5	11	20	0	48	PW3			
9	30	BG Bleed	0	1	38	4	2	53	64	53	64	13	13	13	13	50	80	31	Home with ESD			
10	35	LACS	0	1	10	7	7	38	42	37	40	12	13	12	13	50	35	48	Home with CNRT and NOP			
11																						
12	Mean		0	15.6667	28.1111	3.44444	3	46.1111	58.6667	48.3333	57.5556	9.77778	12.7778	9.77778	12.7778	55.5556	55.5556	26.7778				
13	Median		0	15	36	4	2	41	64	51	66	11	13	11	13	50	70	24				
14	Mode		0	21	38	0	0	38	67	63	67	12	13	11	15	75	70	48				
15	Standard Deviation		0	12.659	14.8193	3.67801	3.1225	12.0876	12.3085	14.8324	14.1696	3.83333	1.7873	4.08588	2.04803	23.3779	32.3501	13.1413				
16																						
17																						
18																						
19																						
20																						
21																						
22																						
23																						
24																						

Sheet1 | Demo | Full Data | Groups | **No Groups** | Sheet2

Appendix 12 SPSS Data Input

group data set sau

	Group	StrokeType	Groupscalemoded	RMSbaseline	RMS05	QTbaseline	QTQtS	StrokeScalePSL
1	Group	POCS	1.00	20.00	30.00	2.00	.00	82.00
2	Group	Bleed	2.00	29.00	33.00	5.00	3.00	35.00
3	Group	LACS	3.00	4.00	11.00	9.00	3.00	90.00
4	Group	PACS	3.00	24.00	38.00	.00	.00	85.00
5	Group	POCS	1.00	13.00	22.00	.00	.00	39.00
6	Group	LACS	5.00	10.00	12.00	5.00	.00	90.00
7	Group	PACS	4.00	13.00	23.00	.00	.00	39.00
8	Group	TACS	1.00	15.00	15.00	8.00	8.00	19.00
9	Group	PACS	1.00	16.00	16.00	3.00	3.00	80.00
10	Group	POCS	2.00	19.00	30.00	7.00	1.00	45.00
11	Group	PACS	7.00	20.00	35.00	5.00	8.00	48.00
12	Group	PACS	2.00	5.00	39.00	1.00	.00	38.00
13	Group	Bleed	1.00	35.00	40.00	4.00	.00	49.00
14	Group	PACS	1.00	17.00	40.00	8.00	.00	48.00
15	Group	PACS	3.00	16.00	28.00	5.00	1.00	44.00
16	Group	POCS	5.00	21.00	28.00	.00	.00	59.00
17	Group	PACS	2.00	14.00	28.00	5.00	10.00	43.00
18	Group	LACS	2.00	16.00	38.00	3.00	2.00	47.00
19	Group	POCS	4.00	4.00	24.00	4.00	.00	33.00
20	Group	Bleed	12.00	7.00	22.00	4.00	.00	39.00
21	Group	LACS	8.00	20.00	23.00	8.00	.00	42.00
22	Group	POCS	3.00	13.00	40.00	10.00	8.00	80.00
23	Group	Bleed	8.00	5.00	25.00	8.00	3.00	38.00
24	Group	TACS	8.00	19.00	27.00	5.00	3.00	52.00
25	Group	POCS	1.00	19.00	30.00	4.00	.00	59.00
26	Group	PACS	3.00	31.00	35.00	3.00	3.00	66.00
27	Group	PACS	8.00	9.00	17.00	2.00	.00	50.00
28	Group	Bleed	11.00	7.00	27.00	10.00	1.50	32.00
29	Group	Bleed	1.00	3.00	19.00	3.00	.00	49.00
30	NoGroup	POCS	.00	15.00	38.00	.00	.00	52.00
31	NoGroup	LACS	.00	33.00	38.00	.00	.00	83.00
32	NoGroup	TACS	.00	11.00	12.00	10.00	8.00	41.00
33	NoGroup	Bleed	.00	21.00	35.00	5.00	4.00	38.00
34	NoGroup	PACS	.00	21.00	40.00	5.00	.00	38.00
35	NoGroup	PACS	.00	34.00	40.00	.00	1.00	83.00
36	NoGroup	TACS	.00	4.00	4.00	.00	5.00	29.00
37	NoGroup	Bleed	.00	1.00	38.00	4.00	2.00	53.00
38	NoGroup	LACS	.00	1.00	10.00	7.00	7.00	38.00

10/28/25, 10:43 PM

Appendix 13 SPSS Output for Inferential Statistics

Independent-samples Mann-Whitney U test p ≤ 0.05 between groups comparison (group / no group) of the baseline and discharge scores of all psychological outcomes.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of DTbaseline is the same across categories of Group.	Independent-Samples Mann-Whitney U Test	.417[c]	Retain the null hypothesis.
2	The distribution of DTDIS is the same across categories of Group.	Independent-Samples Mann-Whitney U Test	.325[c]	Retain the null hypothesis.
3	The distribution of PsycscorePBL is the same across categories of Group.	Independent-Samples Mann-Whitney U Test	.360[c]	Retain the null hypothesis.
4	The distribution of PsychscorePDC is the same across categories of Group.	Independent-Samples Mann-Whitney U Test	.457[c]	Retain the null hypothesis.

a. The significance level is .050.
b. Asymptotic significance is displayed.
c. Exact significance is displayed for this test.

Independent-samples Mann-Whitney U test p ≤ 0.05 between groups comparison (group / no group) of the baseline and discharge scores of all motor outcomes.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of RMBaseline is the same across categories of Group.	Independent-Samples Mann-Whitney U Test	.973[c]	Retain the null hypothesis.
2	The distribution of RMDIS is the same across categories of Group.	Independent-Samples Mann-Whitney U Test	.457[c]	Retain the null hypothesis.
3	The distribution of StrokescalePbL is the same across categories of Group.	Independent-Samples Mann-Whitney U Test	.787[c]	Retain the null hypothesis.

4	The distribution of StrokescalePDC is the same across categories of Group.	Independent-Samples Mann-Whitney U Test	.262[c]	Retain the null hypothesis.

a. The significance level is .050.
b. Asymptotic significance is displayed.
c. Exact significance is displayed for this test.

Independent-samples Mann-Whitney U test p ≤ 0.05 extracted difference in baseline and discharge scores between groups comparison (group / no group) of all outcomes.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of differencebldcper is the same across categories of Group.	Independent-Samples Mann-Whitney U Test	.005[c]	Reject the null hypothesis.
2	The distribution of differencebldcRM is the same across categories of Group.	Independent-Samples Mann-Whitney U Test	.840[c]	Retain the null hypothesis.
3	The distribution of differencebldcDT is the same across categories of Group.	Independent-Samples Mann-Whitney U Test	.074[c]	Retain the null hypothesis.
4	The distribution of differencebldcSSPsy is the same across categories of Group.	Independent-Samples Mann-Whitney U Test	.397[c]	Retain the null hypothesis.
5	The distribution of differencebldcSSP is the same across categories of Group.	Independent-Samples Mann-Whitney U Test	.866[c]	Retain the null hypothesis.

a. The significance level is .050.
b. Asymptotic significance is displayed.
c. Exact significance is displayed for this test.

Independent-samples Mann-Whitney U test p ≤ 0.05 between groups comparison (group / no group) of the baseline and discharge scores of patient perceived improvement %.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of PercentBL is the same across categories of Group.	Independent-Samples Mann-Whitney U Test	.018[c]	Reject the null hypothesis.
2	The distribution of PercentDC is the same across categories of Group.	Independent-Samples Mann-Whitney U Test	.787[c]	Retain the null hypothesis.

a. The significance level is .050.

b. Asymptotic significance is displayed.

c. Exact significance is displayed for this test.

A spearman's correlation p ≤ 0.05 between number of groups attended and LOS in those attending groups.

Correlations

			Groupsattended	LOS
Spearman's rho	Groupsattended	Correlation Coefficient	1.000	.297
		Sig. (2-tailed)	.	.117
		N	29	29
	LOS	Correlation Coefficient	.297	1.000
		Sig. (2-tailed)	.117	.
		N	29	29

Independent-samples Mann-Whitney U with related samples Wilcoxon signed rank test comparing outcome scores taken at baseline and discharge.

Table 1 Group attenders

	DT	RM	SRPM	SRPMpsy	PER
Mann-Whitney U	201.000	135.500	165.500	238.500	103.000
Wilcoxon W	636.000	570.500	600.500	673.500	538.000
Z	-3.489	-4.436	-3.972	-2.863	-4.972
Asymp. Sig. (2-tailed)	<.001	<.001	<.001	.004	<.001

a. Grouping Variable: bl1dc2

Table 2: Those not attending groups

Test Statistics[a]

	DTng	RMng	SRPMng	SRPMPSYng	PERng
Mann-Whitney U	40.000	17.500	14.000	20.500	39.000
Wilcoxon W	85.000	62.500	59.000	65.500	84.000
Z	-.046	-2.036	-2.349	-1.784	-.134
Asymp. Sig. (2-tailed)	.964	.042	.019	.074	.894
Exact Sig. [2*(1-tailed Sig.)]	1.000[b]	.040[b]	.019[b]	.077[b]	.931[b]

a. Grouping Variable: bl1dc2NG
b. Not corrected for ties.