Short Communication

An Upper Extremity Self-Exercise Programme Increases Duration of Exercise in an Acute Rehabilitation Unit and Adherence After Discharge

Ei Mon Zaw,[1] Christine Alejandro Visperas,[1] Tricia Chew Li Ting[2] and San San Tay[1]
[1]Department of Rehabilitation Medicine, [2]Department of Medicine,
Changi General Hospital, Singapore

ABSTRACT

Objectives: To assess the effects of an upper extremity self-exercise programme within an acute inpatient rehabilitation unit on the duration of inpatient exercise and post-discharge treatment adherence.

Study design: Observational study.

Setting: Acute inpatient rehabilitation unit within Changi General Hospital, Singapore.

Subjects: Stroke patients with SAFE (Shoulder Abduction Finger Extension) score not less than 5, admitted to the Inpatient Rehabilitation Unit between July 2019 and March 2020.

Methods: This study was initiated as a quality improvement project. The self-exercise programme was adopted from TRIO (Targeted Rehabilitation Improved Outcomes) Home Programme. It was applied as an adjunct to conventional neurorehabilitation. The duration of daily self-exercise was documented. Patient's feedbacks were obtained before discharge. Post discharge 4-6 weeks, adherence to the programme was followed up via a telephone call.

Results: Two hundred and fifteen stroke patients were screened. Thirty patients participated in the project. While admitted, the median number of days spent in the upper extremity self-exercise programme was 6 days with an average of 25.88 (SD 11.80 minutes) per session. Eighty-three percent of patients gave feedback that the programme was helpful for their recovery. On follow up, 56.7% reported continued adherence after discharge and 36.7% were not contactable.

Conclusions: After the early implementation of an upper extremity self-exercise adopted from the TRIO Home Programme within an acute inpatient rehabilitation unit, the average time spent during admission (25.88 minutes) is approaching the minimum recommendation duration of 30 minute per session and promotes treatment adherence after discharge.

Keywords: stroke, upper extremity, exercise, treatment adherence, rehabilitation

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Introduction

Various stroke guidelines advocate intensive inpatient rehabilitation with a recommended duration of 3 hours per day.[1] According to the National Institute for Health and Care Excellence (NICE) guidelines, it is recommended to initially offer the relevant therapy for at least 45 minutes, 5 days per week.[2] There are various reasons for not providing the amount of therapy according to various stroke guidelines that include time spent on the exchange of information, documentation, and the way work is organized.[3]

Research has also shown that post-stroke rehabilitation can aid patients with stroke in the recovery of function and mobility.[4] Beyond inpatient rehabilitation programmes, rehabilitation extended into the home setting post-discharge has shown to facilitate effective treatment.[5] There has been much research done to analyse factors affecting adherence to home-based exercise programmes. These range from the evaluation of various methods of engagement - usage of smart technology versus paper-based modalities[6] or pictorial versus written instructions and studies to identify barriers to home-based exercise programmes.[7] These include the degree of stroke, patients' motivation, caregiver involvement, and external motivation from family.[8] However, there has been limited research on incorporating home-based exercise programmes in an inpatient setting to promote adherence and thereby maximise the benefits reaped.

At our hospital, admissions correspond to various diagnoses, but approximately 40% of the patients admitted per year were diagnosed with stroke. Generally, most patients are transferred to the acute inpatient rehabilitation unit as early as third day after stroke (median interval of 0 days from stroke unit referral to transfer to inpatient rehabilitation). According to the survey of our inpatients, the average duration of occupational therapy per stroke patient per weekday was 21 minutes. To improve the upper extremity functions, the team utilised the Targeted Rehabilitation Improved Outcomes (TRIO) home

Correspondence to: Ei Mon Zaw, M.B, B.S, MRCP(UK), 2 Simei Street 3, Changi General Hospital, Singapore, 529889.
Email: Ei_Mon_Zaw@cgh.com.sg

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exercise booklet, developed by Auckland University,[9] as it is readily available, with permission to be used and downloaded from the website.[7] Curating a new programme was thus not necessary.

The TRIO home exercise programme targeted patients with shoulder abduction and finger extension (SAFE)[10] scores of 5 and above and was designed to utilise commonly available items to promote both strength and finger dexterity. The SAFE score[10] was calculated by scoring shoulder abduction and finger extension separately, using the Medical Research Council Muscle Scale.[11] The patient's muscle strength in each of these movements was scored between 0 and 5, whereby 0 reflected a lack of muscle activity and 5 reflected normal strength and range of movement. The TRIO programme was modified for simplicity and higher acceptability by patients. With a smaller range of selected tasks, patients can be more focused in the exercises, resulting in increased number of repetitions and intensity of each exercise. The objective of this project was to assess the effects of an upper extremity self-exercise programme adopted from the TRIO home exercise programme within an acute inpatient rehabilitation unit on the duration of exercise during admission and post-discharge adherence.

Methods

This project was initiated as a quality improvement (QI) project in an acute inpatient rehabilitation unit of Changi General Hospital, Singapore. The institutional review board (IRB) has reviewed and determined that the project does not require further ethical deliberation. (IRB Reference number: 2020/2811).

Participants

Stroke patients admitted between July 2019 and March 2020 were screened by medical officer in charge on admission as per inclusion criteria of age > 18 years, SAFE score ≥ 5, the cognitive functional independence measure (FIM) ≥ 5[12] in each component and verbal consent was given. Exclusion criteria included laceration or abrasion or musculoskeletal issues like joint pain, tendon tear or fracture that prevented effective participation. Patients with cognitive impairment who were unable to follow the instructions were excluded.

Materials

The self-exercise toolbox which was supplied to each enrolled patient included the following (Figure 1): a ball (wooden or plastic), cloth pegs, a writing board with pen, a weight-adjustable dumbbell (a fully filled dumbbell weighs 1 kg), plastic cups and spoon, a deck of cards, and a TRIO exercise booklet downloaded from Auckland university website.[7]

Intervention

The self-exercise toolbox was placed at the patient's bedside for easy access throughout their inpatient stay. In the inpatient setting, the patient was shown how to utilize each of the 5 items in the TRIO box. The patient would demonstrate that they understand by performing the exercises to the team member instructing the patient and was encouraged to engage in the exercise of his/her own volition with a recommended minimal duration of 30 minutes a day. The time spent on self-exercise and adherence was documented by the nurse in charge.

The self-exercise programme was not initiated immediately on the day of transfer to the acute rehabilitation unit (which would be after 2 days following stroke admission) if a patient was transferred in after normal work hours. The programme was terminated one day prior to discharge.

On discharge, one of the team members whether a nurse or a medical officer administered a patient feedback survey and reinforced adherence to the exercise programme at home. The patient was provided with a TRIO booklet and advised to utilize common household items such as canned food, fork and spoon, paper and pen and paper cups as illus-

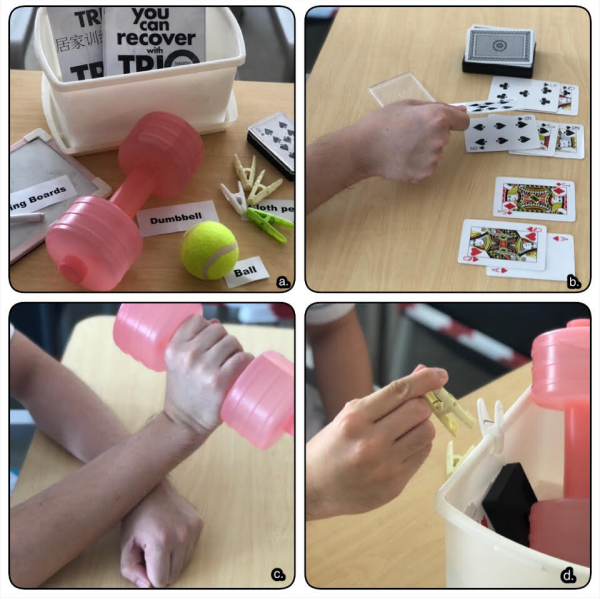


Figure 1. a. Self-Exercise Box: contains TRIO booklet, writing board with pen, water-filled dumbbell, cloth pegs, ball and cards, b. cards sorting, c. wrist extension using water-filled dumbbell, d. cloth pegs clipping onto the box

trated in the booklet for the home exercise programme. The TRIO box was not supplied to the patient on discharge. The patient was advised to perform the exercises for 30 minutes a day. These patients were followed up between four to six weeks post-discharge via a telephone call to enquire if they adhered to the self-exercise programme. In addition, relevant clinical data such as admission Fugl-Meyer score and National Institutes of Health Stroke Scale or NIH Stroke Scale (NIHSS) of the recruited patients were gathered. The SAFE and the NIHSS scores were re-assessed at discharge.

Outcome measurements

The primary outcome measures were the time spent in performing the exercises while being in the inpatient rehabilitation unit and adherence to the programme post discharge. Post discharge, the patient was deemed to be adherent if he/she performed the exercises daily for minimum of 15minutes. Secondary outcome measures were admission and discharge SAFE and NIHSS.

Statistical analysis

Descriptive statistics were used for age, gender and stroke classifications. Continuous data were summarized as mean (standard deviation) or median (interquartile range) for symmetrically distributed and skewed data respectively. Categorical data were summarized by frequency (%). Data analysis was performed using IBM SPSS version 25.0. Pre- and post-data were performed using single-tailed t-test and a p value of < 0.05 was considered statistically significant.

Results

Amongst the 215 patients with stroke screened by the QI team on admission to the inpatient rehabilitation unit between July 2019 and March 2020, 30 patients fulfilled the inclusion criteria for the programme. The baseline demographics and clinical data including the side of the stroke, admission Fugl-Meyer and NIHSS scores, and the rehabilitation length of stay are detailed in Table 1.

During admission, the median duration of the programme was 6 days and the average time spent per day was 25.88 (SD 11.80) minutes. The average SAFE score on admission was 7.9, at discharge score was 8.3, and the average improvement was 0.30 (p = 0.204) after completion of the programme. The average NIHSS score on admission was 5.2, at discharge score was 2.5, and improved by 2.63 (SD 3.94, p = 0.001) in this group of patients.

Twenty-seven (90%) patients gave the feedback regarding the self-exercise programme on the day of discharge, of whom 25 (83.33%) were positive about the programme. They perceived that it was helpful to their recovery, and 24 (80.0%) patients reported that the programme offered them confidence to perform the exercises at home correctly. (Figure 2)

Between four to six weeks post-discharge, 19 (63.33%) patients were contactable for follow-up whereas 11 (36.67%) were not. Seventeen patients (89.47% of the total contactable patients) reported that they continued the exercises according to the TRIO booklet daily. Therefore, 56.67% of all programme participants adhered to the home exercise programme. (Figure 3)

Table 1. Baseline demographics and clinical characteristics of the patients (n = 30)

Demographic information	
Age, mean (SD)	62.26 (12.3)
Gender, n (%)	
Male	23 (76.67)
Lesion characteristic	
Stroke types, n (%)	
Ischaemic	26 (86.67)
Haemorrhagic	4 (13.33)
Stroke sites, n (%)	
Right	17 (56.67)
Left	11 (36.67)
Bilateral	2 (6.67)
Baseline scores	
SAFE score, mean (SD)	7.9 (1.74)
Admission Fugl-Meyer UE motor, median (IQR)	61.5 (48, 64)
Admission Fugl-Meyer UE total, median (IQR)	122 (108.25, 124)
NIHSS, median (IQR)	5 (2, 6)
Length of inpatient rehab stay, median (IQR)	10.5 (7.7, 15)

SAFE, Shoulder Abduction Finger Extension; NIHSS, National Institutes of Health Stroke Scale; UE, upper extremity.

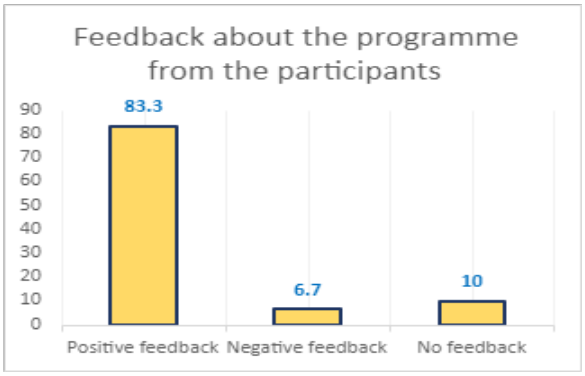


Figure 2. Feedback from the patients participated

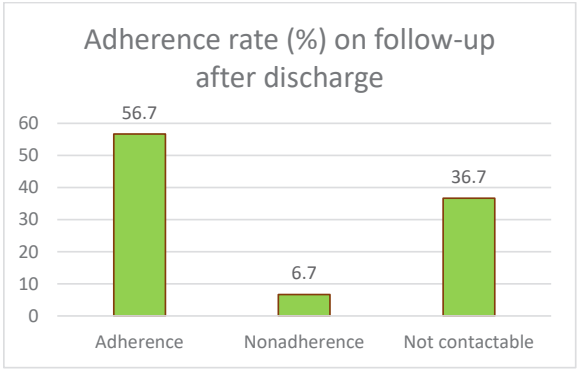


Figure 3. Adherence rate (%) on follow-up

Discussion

Rehabilitation after stroke is not an intervention provided at a single point in time. If we were able to encourage greater patient autonomy and participation at the point of discharge, there could be potential gains later in the journey.[13] Upper extremity impairments are a major contributor to post-stroke functional limitations, which have downstream effects on activities of daily living.[14] In this project of implementing the TRIO home exercise programme within an acute rehabilitation unit, the median duration of the self-exercise programme was 6 days whereas of the rehabilitation length of stay was 10.5 days, and the average time spent per day was 25.88 minutes. According to our previous observation before implementing the TRIO home exercise programme, the average duration of occupational therapy per stroke patient per weekday was 21 minutes. These demonstrate the benefit of early intervention of upper extremity self-exercise programme within an acute rehabilitation phase by promoting more therapy duration during admission.

In addition, majority of the patients gave positive feedback about the programme and the self-reported rates of post-discharge adherence to the programme were 89% in those who were contactable and 56.67% in all patients. These were higher than the adherence rates reported for other home exercise programmes (24.5%).[15] One reason might be that the patients were allowed as integral stakeholders in the rehabilitative process, with some degree of autonomy over therapy duration and time during the rehabilitation admission. They can practice even on weekends when conventional therapy is not available. This shift in their mind-set potentially increased ownership and facilitated greater adherence to the home-based exercise programme post-discharge. Lastly, through the introduction of home-based exercise programmes in an inpatient setting, both patients and their caregivers have a greater length of time being exposed to and familiarising themselves with the exercises. They had many opportunities to clarify any questions concerning the exercises. This may potentially promote greater adherence to post-discharge exercises.

Regarding neurological recovery, the improvement in the SAFE score and NIHSS were modest. The average NIHSS score was improved by 2.63 at discharge. In this study, the rehabilitation length of stay was relatively short and most of the strokes were mild as one of the inclusion criteria was SAFE score at least 5. It was therefore difficult to demonstrate a greater degree of improvement within a short period of time. However, Kerr et al. (2012) found that NIHSS was sensitive to change as early as after 7 days post stroke.[16]

As this study was initiated as a departmental-level QI pilot, the sample size was limited. Furthermore, no pre-intervention data besides baseline duration of occupational therapy (OT) were available. The length of stay was generally short and discharge functional scores such as Fugl-Meyer was not available. Self-reported compliance rates might have been subject to respondents' recall bias, which could potentially over represent adherence rates in this population. In addition, to establish the long-term benefit of early intervention of upper extremity self-exercise programme in patients with acute stroke, it is necessary to follow-up the patients over a period of time. Further collaboration with allied health professionals for assessment of neurological and functional outcomes will strengthen the study. The average time spent in OT was assessed in an earlier cohort of patients. It is assumed that the additional 25.8 minutes which spent in self-exercise would be able to make up to 45 minutes per day of OT per NICE guideline.

Conclusions

Based on the preliminary results, it is possible to initiate and incorporate the TRIO home-based exercise programme as an upper extremity self-exercise programme in an acute inpatient rehabilitation setting to promote post-discharge adherence for patients with mild stroke. This provides patients with greater autonomy in their recovery process and increases the duration of time patients spend exercising their upper extremities every day. This is an innovative way to address two issues with one intervention.

Disclosure

The authors declare no potential conflicts of interest.

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