RESEARCH ARTICLE

REVISED Activity monitoring of stroke patients by physiotherapist and caregivers in a hospital setting: A pilot study [version 2; peer review: 2 approved, 2 not approved]

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Abstract

Background

Activity monitoring is a necessary technique to ensure stroke survivors' activity levels in the hospital are within optimal levels as this is important for enhanced motor recovery. However, this could be time-consuming for healthcare professionals like physiotherapists. Activity monitoring by caregivers could be an alternate option. Therefore, our aim was to compare the activity monitoring of stroke survivors by caregivers and physiotherapists during early phase in a hospital setting.

Methods

An observation study was carried out in the neuroscience ward in a tertiary care hospital among 17 stroke survivors. Physiotherapist and caregivers were instructed to use an activity log chart that was developed during previous research conducted by the same authors for observing the activities performed by the patients every 15 minutes from 8 AM to 5 PM across one day. Data collected were

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analysed using Stata 15. Kappa statistics were carried out to determine the agreement of the observations between the two raters.

Results

A total of 10 male and seven female caregivers of stroke survivors with a mean age of 40.11 ± 9.2 years and a trained physiotherapist participated in the study. A total of 272 observations of caregivers were in agreement with that of the physiotherapist. Inter-rater Kappa statistics showed 60% agreement between the physiotherapist and the caregivers ($p<0.05$).

Conclusions

There was moderate agreement between the physiotherapist and caregiver for activity monitoring of stroke survivors. This suggests behavioural mapping by caregivers may be a potential alternative solution in healthcare settings.

Keywords
Behavioural mapping, activity monitoring, stroke, hospitals, caregivers

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REVISED **Amendments from Version 1**

This version has a much more detailed explanation of the methodology and discussion. We have removed the secondary analysis with multi-rater kappa. The title was amended to include 'a pilot study'.

Any further responses from the reviewers can be found at the end of the article

Introduction

Stroke is one of the leading causes of death and disability worldwide.[1] The American Heart Association has predicted that 2.58 million people will have suffered a stroke by 2047 in Europe alone.[2] In India, the prevalence rates for stroke have been observed to vary from 44.29/100,000 to 559/100,000 across various regions and communities across India.[3] Functional impairment following acute illnesses, such as stroke, frequently has negative consequences, including sensory, motor, psychosocial, cognitive, and sexual dysfunctions.[4–7] Due to these impairments, stroke survivors have significantly reduced activity levels from an early phase.[8] Stroke patients are known to be only 13% of the total time to be engaged in activities.[9]

The importance of being active from an early phase, which includes acute and early subacute phases, is well-established in stroke survivors. The evidence for functional recovery is rapid in the acute phase and depends on several factors including the amount of activity that is done by the patient.[10,11] Research shows being active from an early phase influences brain remodelling.[12–16] This prevents loss of muscle mass, increase muscle strength, avoid complications,[17–21] exploit the neuroplasticity and enhance brain functions, and improve gait in an individual.[22–24] Physical activity also has the potential to provide psychosocial benefits.[25] Being active facilitates physiological and morphological neuroplasticity after stroke that are responsible for motor improvement.

In addition to physical activity, recent evidence shows that cognitive activities to stimulate the prefrontal cortex, helps in regulating working memory, planning, attention and self-monitoring, organizing and motivation, which results in an improvement in learning new skills and abilities and enhancing functional recovery and behavioural changes.[26,27] Further, being socially active has shown better quality of life.[28] Importantly, high levels of social activity have been linked to decreased risk of depression, reduced adverse events, better self-rated physical health, increase life satisfaction and reduced mortality risk.[29] To encapsulate, activities can be in the form of physical, cognitive and social which were shown to improve brain plasticity.[30–33]

Hence, it is vital for stroke survivors to be active from an early phase. However, patients undergoing inpatient rehabilitation after stroke have limited opportunities to be active.[34,35] As a result, sedentary behaviour during the hospital stay could limit the potential for optimal stroke recovery. Studies suggest that stroke survivors are sedentary in hospital settings and are described as 'inactive and alone'.[11] This is concerning because of the strong association between higher levels of inactivity and a decreased rate of functional recovery.[36] For this reason, special interest has been placed to explore the amount of activities in stroke patients during the early phase.[37] Although a number of tools exists to measure physical activity, only observational tools like log chart, diaries exists to capture physical, cognitive and social activity.[38]

Behavioural mapping is a well-known observational method that can be used for recording and observing various behaviours.[39] It allows researchers and clinicians the opportunity to collect, analyse and represent information in resourceful ways, which help to determine how one's environment may influence their behaviour.[40] It is an effective tool to represent behavioural patterns in any location.[41,42] Behavioural mapping has also been used for assessing patients' behaviour in hospital settings, including monitoring their physical, cognitive and social activities.[43–45]

By using this method to measure stroke survivors' activity levels in hospital wards can help determine their activity and sedentary behaviour. Existing studies show that behavioural mapping for activity monitoring is mostly carried out by professionals or researchers, including physiotherapists, and is usually done either for one or multiple days.[43,44,46–48] However, this method poses a challenge for the healthcare workers as it can be time-consuming due to a longer evaluation period. Hence, it may require multiple people to monitor the activities of the patient, making the method less feasible.

Activity monitoring by caregivers of the patients may be an alternative solution. Caregivers are known to be with the patient for a large amount of time during their hospital stay.[49] However, the accuracy of measurement by caregivers compared to monitoring by rehabilitation professionals need to be ascertained. Therefore, the study aimed to determine the interrater agreement between the activity monitoring of stroke survivors carried out by the caregivers and physiotherapist in an acute hospital setting.

Methods

Ethics

This study was a part of a larger ongoing study that aims to enhance the activity levels of stroke survivors and was approved by the Institutional Ethics Committee, Kasturba Medical College and Kasturba Hospital, Manipal (IEC 438/2019) on 16th July, 2019. This study was conducted prior to the commencement of the main study and included a different population of participants. The study was conducted in the neuroscience ward of Kasturba Hospital, Manipal in Southern India.

Participants

Eligibility criteria

All the stroke patients admitted to the ward were screened for the eligibility criteria from July 2020 to November 2020. As this was a pilot study, we conducted a time-bound design. We included caregivers of stroke patients affected with the supra-tentorial lesions, aged between 18 and 80 years, medically stable with no other comorbidities and who could functionally communicate. We excluded caregivers of patients who underwent surgery and with other impairments like fractures, musculoskeletal, cardiovascular, neurological and other chronic diseases that could affect their activity levels. In addition, we only included primary caregivers who are with the patient for most time during the day in the ward. Further, we included caregivers without any psychological/psychiatric disorders and who could functionally communicate. A physiotherapy intern trained in activity monitoring was recruited after obtaining a informed consent.

Outcome

The behavioural mapping was carried out using an activity log chart that has been developed to monitor the activities of the stroke patient during their hospital stay. It has components of physical, cognitive, social activities, sedentary time and therapy time that stroke patients perform in a hospital. All the activities in the activity log chart were finalized after conducting a thorough literature search and observations of activities performed by the stroke patients in the hospital for nine hours per day for a duration of one week. The log chart has activities written in English and Kannada (regional language) along with the image depicting the activity being performed. This was to ensure that the caregivers comprehend the log chart, irrespective of their education level. The activity log chart can be found as *Underlying data.*[57] Further, the log chart was content validated among 15 experts from different fields in healthcare with expertise in stroke rehabilitation and physical activity and was tested on 20 stroke patients to determine the usability and administrative difficulties prior to the commencement of this study (unpublished work, Shankaranarayana AM, Natarajan M, Solomon JM). The copyright for the log chart has been applied with the Government of India. The log chart has a separate component of exercise, which is distinguished from therapy time. The therapy time may include physiotherapy, occupational therapy, speech therapy and psychology. During therapy sessions, the patient is accompanied by a therapist. 'Exercise' as a stand-alone component refers to exercises performed by the participant outside of therapy time.

Procedure

All stroke patients admitted in the neuroscience ward were screened for the criteria. Eligible patients and their caregivers were explained about the study, and written informed consent was obtained from both patients and caregivers. The caregivers and the physiotherapist were explained about the procedure of monitoring the patients along with the usage of the activity log chart. All the instructions to record the activities were provided one day prior to the day of observation, and the principal investigator clarified any queries regarding activities to be monitored. In addition, the caregivers were also trained to use the activity log chart by simulating examples.

The activities in the chart were grouped into physical, social and cognitive activity, and both the raters (caregiver and the physiotherapist) were asked to mark a tick (✓) against the corresponding activity that the patient was doing at a particular time slot. At any time, if the patient was doing two or more activities at the same time (example: eating and reading, walking and talking), the raters were asked to mark both the activities. The observations were carried out every 15 minutes by both the caregiver and physiotherapist for a single day. Research has shown that activity monitoring is generally carried on for one to two days. This allows a total possibility of 37 observations per patient by each rater. The principal investigator (AMS) provided the chart before 8 AM on the day of observation and collected it back at 5 PM after the caregiver completed all the observations. Both the caregiver and physiotherapist were instructed and monitored by the principal investigator to not discuss or see the other person's chart to prevent contamination of results. The caregivers were informed to monitor the patients' activities as much as they possibly could during that time period. They were not provided with 15th minute reminders, as this may lead to bias. However, a research assistant was consigned to conduct periodic monitoring with the caregivers about their activity monitoring. Although the caregivers monitored only their patients (ratio 1:1), the physiotherapist monitored multiple patients on a single day.

Statistical analysis

Descriptive statistics were used to summarize the demographic characteristics of patients and caregivers. As this was a pilot time-bound study, we did not calculate the sample size. However, we conducted the power analysis for the study. Percentage agreement for monitoring between the caregiver and the physiotherapist was calculated for overall activities, each domain and each activity. Analysis was carried out using Stata 15 (RRID:SCR_012763) (free alternative, Rstudio). Agreement between the two raters domain wise was assessed using Kappa statistics. Multi-rater kappa was used to assess the agreement across the different time points. Kappa values of ≤ 0 as indicating no agreement and 0.01–0.20 as none to slight, 0.21–0.40 as fair, 0.41– 0.60 as moderate, 0.61–0.80 as substantial, and 0.81–1.00 as good agreement.[50]

Results

A total of 60 stroke participants were assessed for eligibility and 17 were recruited for this study. The main reasons for excluding were patients who underwent surgery (n=26), patients with recurrent stroke (n=12) and those who could not comprehend (n=5). The demographic characteristics of the stroke survivors and caregivers who participated in the study are given in Table 1 and Table 2, respectively.[57] The physiotherapist was an intern who had received training to monitor the stroke patients activities.

A total of 17 caregivers of the stroke survivors, of which 10 were male and seven female participated in the study with the mean (SD) age of 40.11 ± 9.2 years. The socio-educational details of the caregivers who participated in the study are given in Table 2.

The behavioural mapping carried out showed the following observations. Out of the possible 629 observations (37 observations/participant), the physiotherapist marked 535 (85%), while caregivers marked 424 (67.5%). A total of 272 out of 424 (64.2%) caregiver observations had an agreement with the physiotherapist observations.

Agreement between caregivers and physiotherapist varied significantly for different activities as it ranged from 0% (lowest) for bathing, dressing and 100% (highest) for grooming. The percentage agreement for different activities monitored by caregivers and physiotherapist are shown in Figure 1. Further, the agreement of activities under physical, cognitive and social domains were 42, 38 and 43%, respectively.

Inter-rater agreement between the caregiver and the physiotherapist for the various activities showed a Cohen's Kappa of 0.61 with 95% CI (0.55, 0.66) and p value <0.001. Our study had a 90% power, that we caluculated using G*Power software.

Table 1. Demographic characteristics of the stroke survivors in the study (n=17).

Characteristics	Value
Age in years (Mean ± SD)	53.35 ± 16.4
Sex	
Male:	10
Female	07
NIHSS score	
Mild:	11
Moderate:	04
Moderate to severe:	02
Post stroke duration in days (Mean ± SD)	3.47 ± 1.32
Type of stroke	
Ischaemic:	11
Haemorrhagic:	06
Side of stroke	
Left:	12
Right:	05

NIHSS, National Institutes of Health Stroke Scale.

Table 2. Socio-educational details of the caregivers who participated in the study (n=17).

Characteristics	Frequency (number of participants)
Relation to the patient	
Spouse:	08
Children/Grandchildren:	06
Daughter-in-law:	01
Sibling:	02
Education	
Nil:	01
<High school:	04
High school:	08
Graduate:	04
Occupation	
Homemaker:	05
Farmer:	03
Employed:	05
Healthcare worker:	01
Own business/freelancer:	03
Basic knowledge * about stroke	06
Previous experience as a caregiver in a hospital	05

*Fundamental causes, treatments and prognosis of the stroke.

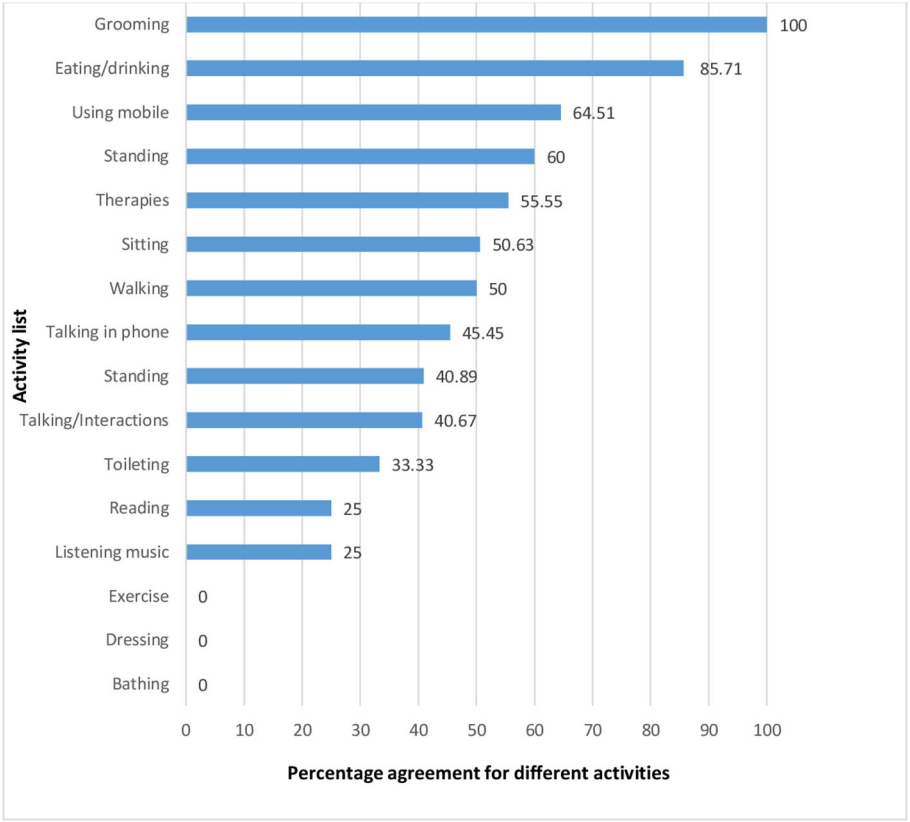

Figure 1. Percentage agreement for different activities.

Discussion

The aim of this study was to compare the observations made by physiotherapist and caregivers to capture the possibility of the caregivers in monitoring the patients' activities in acute care settings. Our results showed that the agreement between both the observations was 64.2%, implying that caregivers could not monitor the activity of patients as accurately as the physiotherapist. However, the discrepancy in the observations could be due to many reasons. First, the subjectivity of the behavioural mapping by itself could have led to the variability in observations.[51] Second, though the instructions were given to observe every 15 minutes, the time of observation could have varied by seconds between the physiotherapist and the caregivers, which is enough to change the activity. For example, in the initial seconds of 8 AM (8:00:00) the patient may have been sitting, but by the end of 8 AM (8:00:45), he may be standing and talking. Hence, the patient could have switched their activity between those two observations, leading to variability. Another reason may be due to the variability that could have occurred in situations while the patient was performing more than one activity simultaneously. Although the caregivers were asked to mark all the activities in such situations, it was noted that quite a few times the caregiver had only marked a single activity whilst the physiotherapist had marked dual activities. For instance, a patient walking while talking over the phone was marked for walking alone by the caregiver, while the physiotherapist marked both walking and talking on the phone.

Though the caregivers are with patients most of the time in the hospital, they may move out of the ward for various requirements related to the patient and for other personal reasons. These reasons could explain the reduced percentage of observations by caregivers compared to the physiotherapist. These reasons were supported by a recent study, which states that a family caregiver has high intensity role in the hospital as they have to multitask both physically and mentally.[52] These roles make it challenging for them to tend to additional work besides situations associated with illness and dependency of the patient during the hospital stay.[53] Additionally, evidence shows that caregivers of acute diseases like stroke have more compounded situations due to the sudden change in adaptation required compared to chronic diseases.[54] Another reason could be the change in caregiver of the patient during the observation day. The replaced caregiver would have not received the entire instructions from the previous caregiver leading to loss of vital information regarding the observations. Hence, the new caregiver might not have understood the procedure adequately and did not record the activities diligently. Further, although we used pictures along with words to depict the activities in the log chart, we noticed that many caregivers had not marked the activities for all the time slots. The comprehension level and differences in the education level could be the reason for this. All caregivers had some level of formal education except for one.

A total of 12 caregivers in our study had no previous hospital experience. Since the majority of the caregivers lacked experience in managing a hospital, anxiety and unfamiliarity of the situations in the hospital could have been the reason for the overall reduced activity loggings. This was supported by an earlier study that showed that new caregivers have a higher level of burden and anxiety in the hospital,[49] which might have influenced the observations significantly.

We noticed that caregivers could log some additional activities that the physiotherapist could not. Bathing and dressing were a few such activities that the physiotherapist had not marked. Due to the separate bathing area where the caregivers accompanied the patients sometimes to assist, they could log the activity. However, the physiotherapist on such occasions, could not differentiate and had either not logged anything or marked it as toileting. Whereas, overall, the caregiver had logged both toileting and bathing appropriate to the time slots. In this study, both the physiotherapist and the caregiver did not complete all observations. In the hospitals, for various tests, patients are taken to different test/diagnostic rooms,[55] during which, it would be difficult to monitor patients for their activities. This could be one of the primary reasons for lesser observations made by both physiotherapist and caregivers. These findings suggest that combining the bathing and toileting activity under a single category and adding a section for the test times, which is common for stroke survivors in the early phase could mitigate the disagreement. These factors could be used as anticipated problems in future studies.

The Kappa statistics showed 60% agreement between the physiotherapist and the caregiver. Even though this is not ideal, there is moderate level agreement seen. There may be a potential for enhancing the agreement levels if all the above-mentioned problems are addressed.

In this study, the stroke survivors were observed every 15^{th} minute by the caregivers and the physiotherapist in the hospital. This behavioural mapping gave an insight into the activity levels of stroke survivors in the hospital during the early phase. As this discussed earlier, it is important to determine this due to the impact the activity levels have on recovery. Observations every 15^{th} minute helps us to assess and study the behaviour as it is in the real world, which is a hospital in this study. This is in line with the concept of Ecological Momentary Assessment (EMA) that uses repeated collection of real-world data and is a valid concept to measure participants' behaviour and experience in their natural environment.[56] In our study, we collected data of stroke survivors as they go about with their lives in the hospital.

Determining this could lay foundation to resolve the underlying issues for a particular unwanted behaviour which is sedentary lifestyle.

To our knowledge, this is the first study that compared behavioural mapping between the physiotherapist and the caregivers for the activities performed by stroke patients. The limitation of this study is that it had a low sample size, as this was a phase in a bigger study. We did not do location mapping during the behavioural mapping as it was a fixed location. All the patients recruited were from the same general ward. In addition, as the monitoring was new and unfamiliar to the caregivers, we did not impose the extra detail of location and people present, which are usually carried out during behavioural mapping. Second, the observations in the study were done only on a single day. This limited time window did not make an opportunity for the caregivers and physiotherapist to mark all the activities present in the activity log chart. This could be because some of the activities present in the log chart would not have been performed by the patient on the observation day. Additionally, the change in caregiver would not have allowed the primary caregiver to capture all the activities across the log chart. This can be resolved with multiple days of observation, with which we can expect a broader capture of activities and a better learning curve for activity monitoring. Third, behavioural mapping is a subjective measure of assessment. However, it is the best available method for assessing or recording an individual's behaviour. Alternative activity tracking methods, including wearable sensors, although more objective method of assessment captures physical activity alone and not cognitive or social activity.

Although activity monitoring by caregivers was in moderate agreement with the observations made by physiotherapist, it is important to note that some of the toiletry activities were monitored only by the caregivers. Further, the agreement level may have scope for improvement considering that some of the above issues are modifiable. Thus, there is a potential for caregivers to perform behavioural mapping of stroke. This paves way for a feasible method of behavioural mapping in healthcare settings. Future studies are directed towards the larger sample and longer periods of activity monitoring.

Data availability

Underlying data

Figshare: F1000 data final. https://doi.org/10.6084/m9.figshare.21076363.[57]

This project contains the following underlying data:

- Activity Log Chart.pdf
- Data repository.xlsx (participant spreadsheet data)

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Open Peer Review

Current Peer Review Status: ✗ ✓ ✗ ✓

Version 2

Reviewer Report 10 November 2023

https://doi.org/10.5256/f1000research.158690.r222341

✓ **Jigna Patel**
Rutgers University, Newark, New Jersey, USA

No further comments to make.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Neurorehabilitation and neuroscience and cardiopulmonary PT.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 10 November 2023

https://doi.org/10.5256/f1000research.158690.r222342

✓ **Ketaki Inamdar**
Virginia Commonwealth University, Richmond, Virginia, USA

The authors have done a commendable job in incorporating my feedback. The revised version has a more robust introduction and discussion section, with more balanced conclusions. Here are some minor suggestions for the authors.

1. Consider rephrasing the last line of the first paragraph in the Introduction section; it appears to contain a minor grammatical error.

2. Given the exclusion of the multi-rater kappa analysis for different time-points, kindly remove it from the analysis plan.

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 12 October 2023

https://doi.org/10.5256/f1000research.136897.r208335

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Ketaki Inamdar
Virginia Commonwealth University, Richmond, Virginia, USA

It was a pleasure to read the paper. The study's results tackle a persistent challenge in literature, namely the monitoring of physical and other activities in clinical populations, offering a novel solution*. For this reason, I believe these findings should be considered for indexing*. However, I would like to recommend significant modifications to enhance the scientific rigor of the study. The current results are presented too strongly given the design and sample size. I suggest toning down the findings, emphasizing the pilot and feasibility testing component of the study, and engaging in a critical discussion on how these results can inform the design of caregiver-monitored activity logs during early-phase stroke rehabilitation.

Title:

- Consider adding "Pilot" to the title due to the sample size.

Abstract:
Well-written, minor suggestions:

- Consider adding "early phase" before "hospital settings" to distinguish from outpatient rehabilitation.
- Insert "across one day" before "every 15 minutes" for clarity.
- Include brief demographics for physiotherapists as participants.

Introduction:
Paragraph 1:
Please incorporate stroke statistics specific to India to substantiate the study's relevance. Utilize percentages to illustrate the impact, particularly when stating that "stroke survivors have significantly reduced activity levels."

- Define "early phase" at the outset to enhance the paper's readability.

Paragraph 2:

- Expand on the benefits of increased activity during the acute phase of stroke recovery and delineate the factors that limit activity, especially in the post-acute phase.

Paragraph 3:

- Briefly talk about the different tools used for behavioural mapping such as video recording, checklists, wearable devices etc., with a brief discussion on pros and cons for each method. Please justify why you selected checklist/log.

Methods:

Inclusion criteria:

- “Functionally communicate” has been used twice in the paragraph.

- Include the inclusion criteria for physiotherapists, specifying their level of expertise (e.g., trained neurophysiotherapists, novice clinicians, experienced clinicians) to provide context on their participation and qualifications in the study.

Outcome:

- Elaborate on the process of developing the activity log, specifying whether the validation involved face validation or content validation, to enhance the clarity and rigor of the log development.

- Specify whether the testing involving 20 stroke patients was related to assessing the practicality and usability of the log. This clarification will provide a better understanding of the purpose and focus of the testing phase.

- Finally, explain why exercise was categorized separately from therapies in the activity log. Given that therapies often encompass exercise in the early phase, clarify the rationale for this distinction and consider discussing how this categorization may have contributed to any discrepancies observed between physiotherapists and caregivers.

Procedure:

- Clarify whether the intern-to-patient ratio was 1:1 or if the intern monitored more than one patient on a particular day. Specify the procedure for patient monitoring when the intern had to take a break.

- Indicate whether caregivers were provided with reminders or prompts every 15 minutes during the monitoring process.

- Provide a rationale for selecting only one working day for agreement testing.

Statistical Analysis:

- Due to the limited sample size in this study, it is important to provide a justification for the chosen sample size. Include information regarding whether a power analysis was conducted.

- I believe the study lacks sufficient statistical power for utilizing multi-rater kappa, a concern

that is indeed emphasized in the discussion. It might be worth considering excluding these specific findings.

Results:

- Integrate relevant details about the physiotherapists into the tables or corresponding paragraphs within the Results section.

- Organizing the kappa agreement according to the three domains of activities in Figure 1 would be beneficial. This would offer insights into the level of agreement within each domain, allowing for a comparison of agreement quality across the domains.

Discussion:

Overall, the authors effectively emphasize the feasibility of utilizing caregiver led activity logs and underscore how the design of the activity log can impact agreement. However, enhancing the discussion through a more critical comparison with existing studies would further bolster the strength of the argument.

Here are some suggestions for the discussion:

- Draw parallels with the fundamental concepts of Ecological Momentary Assessment (EMA) and elaborate on how periodic reminders every 15 minutes could have impacted the reporting within this study.

- Compare the role of caregiver burden and recall burden in subjective reporting studies conducted in similar and other clinical populations.

- Address the learning curve associated with reporting multiple activities by caregivers. The limited reporting duration in this single-day study may not have allowed caregivers to fully grasp the intricacies of reporting various activities, especially if a change in caregivers occurred during the day.

- A discussion on alternative activity tracking methods, such as wearable sensors, should have been included.

- Include a discussion of the rationale behind selecting specific activities, particularly during the initial phase, and its influence on the reporting process. For instance, considering that physiotherapists were unable to access the bathroom area, consolidating toileting-related activities into a single category could ensure equal reporting opportunities for both physiotherapists and caregivers. Likewise, it is anticipated that patients would undergo clinical monitoring and testing early in their recovery phase. Future studies may consider incorporating this aspect into the activity log to mitigate discrepancies related to this particular activity.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Partly

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Neurophysiotherapy, activity monitoring

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 07 Nov 2023

John M Solomon

We, the authors, convey our sincere thanks to the reviewer for spending their valuable time reviewing our manuscript. We are pleased to know the suggestions/ modifications advised. The suggestions helped to enhance the quality of the manuscript. All the suggestions were incorporated/ addressed in the revised manuscript. Our response can be identified below in italics and bold.

1. Title: Consider adding "Pilot" to the title due to the sample size.

Thank you, we agree. We have made a request to the journal for a change in title.

1. Abstract: Well-written, minor suggestions:

- Consider adding "early phase" before "hospital settings" to distinguish from outpatient rehabilitation.
- Insert "across one day" before "every 15 minutes" for clarity
- Include brief demographics for physiotherapists as participants.

The authors would like to thank the reviewer for the suggestion. The suggested changes have been incorporated into the abstract.

1. Introduction:

Paragraph 1: Please incorporate stroke statistics specific to India to substantiate the study's relevance. Utilize percentages to illustrate the impact, particularly when stating that "stroke survivors have significantly reduced activity levels."

- Define "early phase" at the outset to enhance the paper's readability.

Paragraph 2: Expand on the benefits of increased activity during the acute phase of stroke recovery and delineate the factors that limit activity, especially in the post-acute phase.

Paragraph 3: Briefly talk about the different tools used for behavioural mapping such as video recording, checklists, wearable devices etc., with a brief discussion on pros and cons for each method. Please justify why you selected checklist/log.
Thank you for this suggestion. We have added the prevalence data from India and the percentage to the statement. This brings in more clarity to the given information.
Early phase has been defined as suggested. Thank you
We appreciate this suggestion to emphasize the importance of being active and the same has been added.
We agree that the details would give a better insight. We have added more information about the different tools used.

1. Methods:

Inclusion criteria:
"Functionally communicate" has been used twice in the paragraph.
Include the inclusion criteria for physiotherapists, specifying their level of expertise (e.g., trained neurophysiotherapists, novice clinicians, experienced clinicians) to provide context on their participation and qualifications in the study.
Thank you for the suggestion. We have used it twice for two different population. The first one refers to the eligibility in stroke survivors and the second mentioning refers to their caregivers.
We are obliged to rectify this. The same has been added in the methods section.

1. Outcome:

- Elaborate on the process of developing the activity log, specifying whether the validation involved face validation or content validation, to enhance the clarity and rigor of the log development.
- Specify whether the testing involving 20 stroke patients was related to assessing the practicality and usability of the log. This clarification will provide a better understanding of the purpose and focus of the testing phase.
- Finally, explain why exercise was categorized separately from therapies in the activity log. Given that therapies often encompass exercise in the early phase, clarify the rationale for this distinction and consider discussing how this categorization may have contributed to any discrepancies observed between physiotherapists and caregivers.

The author would like to thank the reviewer for these suggestions. We have added content validation of the log chart to bring in more clarity and the objective of the testing.
We appreciate the suggestion and have added the same. However, in our opinion, these details would better suit in the manuscript pertaining to the development of the activity log chart.

1. Procedure:

- Clarify whether the intern-to-patient ratio was 1:1 or if the intern monitored more than one patient on a particular day. Specify the procedure for patient monitoring when the intern had to take a break.
- Indicate whether caregivers were provided with reminders or prompts every 15 minutes during the monitoring process.
- Provide a rationale for selecting only one working day for agreement testing.

Thank you for the valuable suggestion. This will help give more details about the procedure. We have edited the same.
We have added the suggested information. Thank you.
We are obliged to rectify this. The same has been added.

1. Statistical Analysis:

- Due to the limited sample size in this study, it is important to provide a justification for the chosen sample size. Include information regarding whether a power analysis was conducted.
- I believe the study lacks sufficient statistical power for utilizing multi-rater kappa, a concern that is indeed emphasized in the discussion. It might be worth considering excluding these specific findings.

We agree with the reviewer. We did a power analysis and the same has been noted in the statistics and results part of the paper. We did not calculate the sample size as this was a pilot study.
We are obliged to rectify this and have removed the same from the manuscript.

1. Results:

- Integrate relevant details about the physiotherapists into the tables or corresponding paragraphs within the Results section.
- Organizing the kappa agreement according to the three domains of activities in Figure 1 would be beneficial. This would offer insights into the level of agreement within each domain, allowing for a comparison of agreement quality across the domains.

We are obliged to rectify this. The same has been added in the text of the results section.
Thank you for the suggestion. In our opinion, arranging the items according to the descending order brings in readability and clarity. However, the suggested information has already been added in the text section.

1. Discussion:

Overall, the authors effectively emphasize the feasibility of utilizing caregiver led activity logs and underscore how the design of the activity log can impact agreement. However, enhancing the discussion through a more critical comparison with existing studies would further bolster the strength of the argument.Here are some suggestions for the discussion:

- Draw parallels with the fundamental concepts of Ecological Momentary Assessment (EMA) and elaborate on how periodic reminders every 15 minutes could have impacted the reporting within this study.
- Compare the role of caregiver burden and recall burden in subjective reporting studies conducted in similar and other clinical populations.
- Address the learning curve associated with reporting multiple activities by caregivers. The limited reporting duration in this single-day study may not have allowed caregivers to fully grasp the intricacies of reporting various activities, especially if a change in caregivers occurred during the day.
- A discussion on alternative activity tracking methods, such as wearable sensors, should have been included.
- Include a discussion of the rationale behind selecting specific activities, particularly

during the initial phase, and its influence on the reporting process. For instance, considering that physiotherapists were unable to access the bathroom area, consolidating toileting-related activities into a single category could ensure equal reporting opportunities for both physiotherapists and caregivers. Likewise, it is anticipated that patients would undergo clinical monitoring and testing early in their recovery phase. Future studies may consider incorporating this aspect into the activity log to mitigate discrepancies related to this particular activity.
Thank you. We appreciate the suggestions put forth for our discussion.
This is a very good point to add. The authors appreciate the reviewer for the suggestion. We have added details of the same.
Thank you for the suggestion. The role of caregiver and the burden has already been discussed.
We agree that this would be an important finding to discuss. The same has been added.
Thank you. We agree to this. We have added the same in the discussion.
We appreciate the detailed suggestion. This is very insightful. We have added the same.

Competing Interests: None declared

Reviewer Report 04 August 2023

https://doi.org/10.5256/f1000research.136897.r188815

Shuanglan Lin
Chongqing Medical University, Chongqing, China

Summary
Thank you for the invitation to review this paper. The paper might provide evidence about an alternative option to address activity monitoring in the clinical setting by caregivers (especially in some activities such as bathing and dressing), as this could be time-consuming for healthcare professionals. However, the research methodology and the small sample size in the paper might result in a lack of credibility and validation of the findings. The details of the comments are listed as follows:

Introduction
1. Please provide more information about the stroke status and stroke survivors in India since the study was conducted there.

Eligibility criteria
1. Please list the inclusion and exclusion criteria for the participants to help readers better understand this section.

Outcome
1. Please clarify the specific activities included in the physical, cognitive and social

components.

2. Please describe the log chart's validation process and provide more information about the experts.

Procedure

1. Please clarify if the caregivers and physiotherapists received the same training about using the activity log chart to ensure activity marking consistency during the implementation.

2. A single-day observation of activities among 17 stroke survivors might not provide enough evidence and draw a solid conclusion for the study. Plus, behavioural mapping is a subjective process that can lead to variability during observations.

Results

1. In Figure 1, it's better to categorise all the recorded activities under the three components to help readers better understand "*the agreement of activities under physical, cognitive and social domains were 42, 38 and 43%, respectively*".

2. I suggest analysing the factors that cause the inconsistency of agreement between caregivers and the physiotherapist, such as the physiotherapist who have received professional training and better understands different activities, or whether the caregivers' educational background will lead to the deviation of observation.

Discussion

1. "*Both the physiotherapist and the caregiver did not complete all observations*" implies that the study's observations were done only on a single day is not enough to conclude.

2. As some of the toiletry activities were monitored only by the caregivers, there is still a potential for caregivers to perform behavioural mapping of stroke in the clinical after clarifying and addressing the factors that caused the discrepancy of agreement between caregivers and the physiotherapist.

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

No

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Stroke, stroke transitional care, data analysis

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Reviewer Report 03 August 2023

https://doi.org/10.5256/f1000research.136897.r188821

Jigna Patel
Rutgers University, Newark, New Jersey, USA

This is a simple study design that asks an important question. Specifically, the authors compared the activity monitoring of stroke survivors by caregivers and physiotherapists in a hospital setting. The amount of activity performed by stroke survivors early after stroke may affect long term recovery, thus activity monitoring by caregivers can provide an alternate means of tracking this measure. The authors found a 60% agreement between the physiotherapists and the caregivers, using Kappa statistics. The study design has some limitations which are explained by the authors.

Minor comments:

1. The second sentence in second paragraph of introduction is awkward. Are you trying to say there is evidence that recovery happens rapidly in the acute phase? Please reword.

2. Last sentence in introduction should say amount of 'activity' not 'activities'.

3. Remove the word 'By' at the beginning of the first sentence in the fourth paragraph of introduction.

4. In the eligibility section, you use the word 'supratentorial', so only cortical strokes included? Please clarify.

5. Procedure section: change sentences to, 'patients and caregivers were given explanations about the study'.

I approve this study as is, with the changes noted in the minor comments section.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Neurorehabilitation and neuroscience and cardiopulmonary PT.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 01 June 2023

https://doi.org/10.5256/f1000research.136897.r170683

Lucian Bezuidenhout
Department of Neurobiology, Care Sciences and Society, Division of Physiotherapy, Karolinska Institutet, Stockholm, Sweden

Summary
Thank you for the opportunity to review this paper. Overall, the paper tackles an interesting topic, which is comparing the activity monitoring of stroke survivors by physiotherapists and caregivers. While this is a relevant topic and has some merit since caregiver monitoring can potentially be cost-effective and time efficient, however, there are some major concerns that I would like the authors to clarify. More specifically, regarding the methods used. The authors only used 1 day, although I don't agree with 1 day being a valid measurement period for 17 stroke survivors. The authors need to strongly justify this, especially due to the subjectivity of rating by both the physios and caregivers and the experience of the caregivers in using the rating tool. In addition to this, there is missing data on observing (i.e. toileting, bathing, testing). The hypothesis of the authors also assumes that caregivers will be there to monitor the patients all day around, which is not always possible.

Abstract

- The first line of the conclusion "*There was moderate agreement between the physiotherapist and caregiver for activity monitoring of stroke survivors*" is rather a result than a conclusion. I suggest the authors rephrase the conclusion to conclude the overall outcome of their study.

Introduction

- In the first paragraph, the authors write about the global and European prevalence of stroke. While this is good, I suggest the authors also add about the prevalence of stroke in India, since this is where the study was conducted.

- In the second paragraph, the authors address the physical (in)activity of people with stroke during inpatient rehab. Are there any recommendations for PA during this period for stroke survivors? i.e. number of steps per day or min spent in different PA levels for example?

- In the third paragraph, the authors briefly touch on the behavioral mapping tool. I think this paragraph could be strengthened by expanding on this tool, i.e., what does it consist of? Also, the authors need to address previous studies that have used this tool in people with stroke, what have they found? Are there previous studies that have done something like your study?

Methods

In the 'Eligibility criteria' paragraph:

- Can the authors give examples of who the caregivers could be?

- Also, can the authors first list all the inclusion criteria and then list the exclusion criteria? Was understanding or previous experience of the activity log an inclusion criterion?

In the 'Outcome' paragraph:

- Did the caregivers or the physios get any training on using the activity log?

- The authors mention that "*the log chart was sent to 15 experts for validation*". How was this done? Who were the experts?

Procedure

- The authors mention that "*The observations were carried out every 15 min*". What happened when the caregivers or physios had to take a break i.e. go to the toilet or lunch break?

- Is one day enough to make an overall conclusion? The authors need to strongly justify why they only did 1 day of measurements.

Results

- Figure 1, can the authors separate (group) the different activities into the 3 different domains i.e. physical, cognitive and social? Therefore, it would be easier to see which of these domains had the best agreement or the worst.

- It would also be interesting to look at the agreement over the course of the day. For example, did the accuracy decrease over the day i.e., did the raters get tired of observing the people with stroke?

Discussion

- The discussion lacks comparison to other studies that conducted similar observations. What did they find compared to your results?

- Have the authors thought about using accelerometry to measure activity? Although the accelerometry might not be able to yield the exact activity being done, it could give an overall PA output, which could be a good marker for measuring changes in activity levels. I think this is worth a mention in the discussion.

- Although I think one can't really draw any conclusion from 1 day of observations, what does it mean clinically that there is a 60% agreement between the physiotherapist and the caregivers? Is this enough? What can be done to increase this agreement? Is this a future valid technique?

- One of the possible clinical implications of this study is if the caregivers don't want to participate in the activity logging. Maybe they just want to be present and support the person affected by stroke.

- This paper does not have an overall conclusion.

Is the work clearly and accurately presented and does it cite the current literature?
Partly

Is the study design appropriate and is the work technically sound?
No

Are sufficient details of methods and analysis provided to allow replication by others?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
No

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Physical activity, Stroke, neurological diseases. Data analysis procedures, scientific methods.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.