JOURNAL OF INTERNATIONAL CRISIS AND RISK COMMUNICATION RESEARCH
ISSN: 2576-0017
2024, VOL 7, NO S6

A systematic review to assess effect of Additional Physical Therapy on Length of Stay and Health Outcomes in ill People

Sadon Alotaibi[1]
Turki Alqurashi[2]
Rami Althomali[3]
Mujahed Mohammad Alshehri[4]
Ali Alqahtani[5]
Faisal Althumali[6]
Eisa Al Sawat[7]
Mohammed Ali Al Asmari[8]

1. Physiotherapy, Taif Health Complex
2. Physiotherapy, Taif Health Complex
3. Physiotherapy, King Faisal Medical Complex
4. Physiotherapy, King Faisal Medical Complex Taif
5. Physiotherapy, King Faisal Medical Complex Taif
6. Physiotherapy, Diabetic Center-Taif Health Cluster
7. Physiotherapy, King Faisal Medical Complex Taif
8. Physiotherapy, King Abdulaziz Specialist Hospital

Abstract
Objective: To revise an earlier analysis on whether more physical therapy services for patients with acute or subacute conditions shorten hospital stays, enhance health outcomes, and are safe and economical.
Data sources: Updates were made between 2010 and June 2023 using electronic database searches (AMED, CINAHL, EMBASE, MEDLINE, PEDro, and PubMed). **Selection of the study:** Eligible studies were randomized controlled trials assessing the effects of extra physical therapy treatments on patient health outcomes, duration of stay, or cost-effectiveness. Eleven additional publications from eight new randomized controlled trials with 1563 individuals were chosen from the 1524 potentially relevant articles found by the search. This review includes a total of 24 randomized controlled studies with 3262 participants. **Data extraction:** The form utilized in the initial systematic review was used to extract the data. The PEDro scale was used to evaluate the methodological quality,
Result: Standardized mean differences (SMDs) and 95% confidence intervals (CIs) were computed by pooling post-intervention data using an inverse variance, random-effects model. Additional physical therapy services were found to shorten hospital stays by 3 days in sub-acute settings (MD -2.8, 95% CI -4.6 to -0.9, I^2 0%) and by 0.6 days in acute situations (MD -0.6, 95% CI -1.1 to 0.0, I^2 65%), according to moderately high quality evidence. Without causing an increase in adverse events, more physical therapy produced modest gains in self-care (SMD 0.11, 95% CI 0.03 to 0.19, I^2 0%), activities of daily living (SMD 0.13, 95% CI 0.02 to 0.25, I^2 15%), and health-related quality of life (SMD 0.12, 95% CI 0.03 to 0.21, I^2 0%). Walking abilities did not much change. According to one study, extra physical therapy was probably more affordable for sub-acute rehabilitation.
Conclusions: More physical therapy services decrease the length of stay for people in hospitals while improving patient activity and participation results. Preliminary data indicates that these advantages might be cost-effective, and they are probably safe.
Keywords: Rehabilitation; Length of Stay; Quality of Life; Activities of Daily Living; Physical Therapy; Review; Systematic.

Introduction

It is not common practice to provide extra physical therapy services (1, 2), and there is frequently discussion about how to balance workload distribution and expenses to get the best outcomes for patients and healthcare systems. The possibility that more services could shorten hospital stays, which is linked to lower hospital expenses, is a tenable justification for being able to expand services without raising costs (3). Single trials, however, lack the potential to demonstrate variations in length of stay. There is still disagreement over how many physical therapy services should be offered to inpatients.

Although the 95% CI crossed zero, suggesting uncertainty in the findings, our 2011 (4) systematic review of 16 randomized controlled trials suggested that additional physical therapy services (defined as longer or more physical therapy sessions of similar content) may have decreased length of stay in acute and sub-acute settings. Additionally, the research discovered that additional physical therapy had no effect on self-care measures but slightly to moderately improved walking capacity, activity, and quality of life. The data had a considerable degree of variety. New large randomized controlled studies have been released since that review was published (5,6), which will improve the quality of the evidence and possibly clear up any ambiguities in the original review. Furthermore, in order to improve the quality of reviews, the GRADE methodology was created in 2011 (7) for evaluating the body of evidence. This method may be used to score the quality of evidence.

Determining if more physical therapy treatments for patients with acute or subacute medical conditions improve health outcomes (body structure and function, activity, and participation) and shorten duration of stay was the goal of this systematic review. Adverse events and the cost-effectiveness of further physical treatment were secondary outcomes.

Method

This review was prospectively registered with the PROSPERO database of systematic reviews (CRD42017064827) and reported in accordance with the PRISMA recommendations for high-quality reporting of systematic reviews (8).

Information sources, search, and study selection

Using search terms and synonyms for the two primary constructs of physical therapy and the amount of therapy, a search method was created to find trials. The databases MEDLINE, CINAHL, AMED, PEDro, PubMed, and EMBASE were searched between 2010 (because the last search was done in May 2010) and June 5, 2023. Using database selections (see Appendix 1) or recognized search techniques (9) the search was restricted to randomized controlled trials. To make sure all pertinent trials were found, manual scanning of the reference lists of the included trials and citation tracking of the prior systematic review (using Google Scholar) were also carried out.

The titles and abstracts of all identified trials were subjected to separate application of inclusion and exclusion criteria by two reviewers (CP and NT) in order to weed out those that blatantly failed to fit the requirements. Trials were acquired in full-text for evaluation in cases where it was unclear if they satisfied the inclusion requirements. The two reviewers discussed any disagreements and, in the event that no agreement could be achieved, a third reviewer (NS) was consulted to reach a final conclusion. The Cohen's kappa was used to measure the level of agreement among reviewers; a kappa of.21 to.40 indicated fair agreement,.41 to.60 indicated moderate agreement,.61 to.80 indicated substantial agreement, and.81 to.99 indicated nearly perfect agreement (10).

Criteria for eligibility

A randomized controlled trial that compared an extra dose of physical therapy to the standard care amount for adult patients (≥18 years) receiving acute or sub-acute treatment after an acute event (e.g., fall, surgery, stroke, cardiac event) qualified for inclusion. The physical therapy intervention could be any intervention described by the American Physical Therapy Association (11) and had to be administered or supervised by a physical therapist. It also had to include an increased quantity (duration or frequency) of the same intervention the control group was receiving.

We included trials of physical therapy treatment following an acute exacerbation of a chronic disease (e.g., acute exacerbation of chronic obstructive pulmonary disease) treated in an acute or sub-acute setting, but excluded trials that assessed physical therapy exercise programs for healthy individuals or physical therapy for risk factor management of chronic health conditions (e.g., cardiovascular disease, diabetes, obesity). Because we wanted to assess the effect of dose rather than the effect of a particular treatment, trials that examined the effects of adding a different treatment to standard care—such as acupuncture, upper limb exercises, or gait training—were disqualified. Additionally, trials that did not provide physical treatment to the comparison group were disqualified.

Data extraction

It made advantage of the data extraction form created for the last review (4). A second reviewer verified the accuracy of the data that the first reviewer had gathered. The reviewers consulted the original report in case of any differences. Health conditions (e.g., orthopaedic, neurological, cardiothoracic), participant characteristics (age, sex), setting (acute, sub-acute, inpatient, outpatient), intervention (type, duration, and frequency of physical therapy for experimental and comparison groups), outcomes (primary and secondary outcomes, outcome measures used, timing of outcome assessment), adverse events, and patient satisfaction were among the data that were extracted.

Results of interest

Patient health outcomes and length of stay were the main results. According to the World Health Organization's International Classification of Functioning, Disability and Health (14), patient health outcomes were categorized into three domains: participation, activity, and body function. According to this concept, we regarded walking ability measurements as indicators of bodily function, and quality of life metrics as indicators of involvement (see Box 1).

Adverse events and cost effectiveness were secondary outcomes.

Results synthesis

Hedges g was used to compute the standardized mean differences for the outcomes based on post-intervention means and the pooled estimate of post-intervention standard deviations. Some variables that were not in this

format had to be converted using techniques recommended by Hozo et al. (15) and Higgins and Green (9), since mean and standard deviation values are required when computing the standardized mean difference.
A random-effects model for outcomes employing inverse variance techniques was used. According to Cohen et al. (16), the standardized mean difference's strength was assessed descriptively, with 0.2 denoting a modest effect, 0.5 a moderate effect, and 0.8 a high effect. Only trial results that reported on the common outcome categories utilized in the prior review—length of stay, walking capacity, activity, self-care, and quality of life—were combined into one pool.
The I2 statistic was used to measure statistical heterogeneity, and values more than 50% indicated significant levels of heterogeneity (17). Sub-group analyses, such as distinct analyses for trials carried out in acute and sub-acute settings, were carried out post-hoc in cases where significant levels of heterogeneity were seen in an effort to explain the heterogeneity. If one trial contributed more than 50% of the total effect size or if certain trial attributes carried a high risk of bias, sensitivity tests were performed to validate the findings
Since tests for funnel plot asymmetry only have adequate power when there are at least 10 trials, funnel plots were made (9).
By dividing the total reported additional physiotherapy by the period of stay or trial, the amount of additional therapy provided per day was determined. Trial size variations were taken into consideration by calculating weighted mean averages.

Findings

Selection of studies

1208 papers were screened based on their title and abstract after duplicates were eliminated. 36 papers were obtained in full-text, and there was significant agreement among reviewers when screening titles and abstracts (kappa =.62, 95%CI.46 to.78). It was decided to include 11 publications from 8 research investigations in the revised review (figure 1) out of these.
Data from the same randomized controlled experiment were reported in the papers by Peiris et al. (2012) (18), Peiris et al. (2013) (5), Brusco et al. (2014) (19), and Brusco et al. (2015) (20). Since it included the clinical results for the entire sample (n=996), the Peiris et al. 2013 (5) paper will be referred to as the primary trial for the purposes of this review.
Peiris et al. (2012) examined the physical activity levels of 105 individuals with orthopaedic disorders who received or did not get extra therapy. This study was a subgroup of a larger trial. The whole sample's economic results were the main focus of the experiments conducted by Brusco et al. in 2014 (19) and 2015 (20).
Together with the papers from the prior review, this revised review contains 27 publications from 24 randomized controlled trials. Australia hosted nine trials, the UK hosted eight, Europe hosted five, Brazil hosted one, and Canada hosted one (table 1).

Intervention

To improve results, the experimental group in every study that was included received more physical therapy intervention than the comparison group. Physical therapists and assistants to physical therapists delivered physical therapy procedures in person. A weighted mean average of 198.7 minutes of physical therapy per week (28.4 minutes per day) was administered to comparison group participants in 14 trials. Participants in the experimental group received more intervention, even though the content of the intervention was the same for both groups. This was accomplished by offering physical therapy sessions that were either longer (n=3), extra (n=14), or both (n=2). The manner in which additional physical therapy was administered was not specified in five trials. 2,497 participants in 15 trials measured the quantity of extra physical therapy provided. The weighted mean average of an extra 85.7 minutes of physiotherapy per week, or 12.2 minutes per day, corresponds to a 43% increase in physical therapy services. This varied from an additional 6.6 minutes per day (6) to 85 minutes per day (31).
Additional occupational therapy and physical therapy treatments were provided to participants in four studies (5, 24, 32, 33).

Implications of more physical therapy services

Duration of stay

Additional physical therapy decreased duration of stay by a minor and substantial amount (SMD -0.2, 95%CI -0.3 to -0.1, I2 50%) in 12 studies with 2,285 participants when compared to usual care (figure 2 and table 2). There was moderate quality evidence that additional physical therapy treatments decreased length of stay by 3 days in sub-acute settings in 5 trials (5, 6, 21, 23, 33) with 1659 participants (MD-2.8, 95%CI -4.6 to -0.9, I2 0%). There was low quality evidence that additional physical therapy treatments decreased length of stay in acute settings in 7 trials (22, 29, 32, 34-37) with 626 individuals (MD -0.6, 95%CI -1.1 to 0.0, I2 65%). Subgroup analyses reveal that the SMDs were comparable across various patient diagnoses and settings (table 3), as well as after eliminating a sizable trial that added more than 50% weight to the study (Appendix 2). In three trials (6, 28, 33) with 401 individuals, additional physical therapy shortened length of stay by 9 days in sub-acute stroke populations (MD -9.0, 95%CI -16.3 to -1.6, I2 0%).

Walking ability was evaluated in ten trials with 1,641 subjects. Rivermead Mobility Index (28), Functional Independence Measure (FIM) locomotion (22) and the 6-minute walk test (6, 27, 34) were the measures that were employed. Additional physical therapy treatments did not substantially improve walking ability as compared to normal care, according to moderate quality evidence (SMD 0.1, 95%CI -0.1 to 0.3, I2 46%) (figure 3). Moderate quality evidence of no effect of additional physical therapy on walking speed was obtained in a sub-group analysis of the six trials (5, 6, 21, 30, 38, 39) with 1,208 individuals that measured walking speed (MD 0.01m/s, 95%CI -0.05 to 0.07, I2 54%).

FIM (5, 6, 21, 22), the Barthel index (28, 32, 33, 39, 40), and the modified Iowa Level of Assistance scale (35–37) were used in twelve studies with 2,366 participants to assess the impact of extra physical therapy on self-care. Moderate quality evidence showed that additional physical therapy enhanced self-care by a small and significant amount (SMD 0.1, 95%CI 0.03 to 0.2, I2 0%) as compared to standard care (figure 4). Additional physical treatment raised FIM by 2.1 points (MD 2.1, 95%CI 0.2 to 4.0, I2 0%), according to sub-group analyses of the three trials (1,448 individuals) that evaluated total FIM (5, 6, 21). Additional physical therapy raised the modified Iowa Level of Assistance scale score by 3.1 points (MD 3.1, 95%CI 0.9 to 5.4, I2 0%) in the three trials that evaluated the scale (n=236). Non-significant changes were found for the five trials that evaluated the Barthel Index (n=436) (MD 0.3, 95%CI -0.8 to 1.4, I2 18%). Effect sizes were somewhat higher in acute settings compared to sub-acute situations, according to sub-group analyses (table 3).

There was low quality evidence that additional physical therapy improved activity outcomes by a small but substantial amount (SMD 0.16, 95%CI 0.04 to 0.28, I2 20%) when compared to usual care in 14 trials with 1737 participants (figure 5). The Rivermead Mobility Index (28, 38, 40), the Timed Up and Go test (5, 21, 37), and the Knee Society Scale (activities of daily life function) (29), were among the results used. Acute settings had a greater effect size than sub-acute settings, according to sub-group analyses (table 3).

Physical activity levels were measured in two trials (5, 18, 22). Overall, there was relatively little physical exercise. Patients with orthopedic disorders in a sub-acute hospital environment spent 1.2 hours upright per day (18), while those who underwent coronary artery bypass graft surgery spent 89% of their waking hours sitting or lying down (22). Six days after surgery, Van der Peijl (22) could not find any differences in physical activity levels between patients who got standard care and those who received additional physical therapy. Those who got additional weekend occupational therapy and physical therapy were substantially more physically engaged than those who did not, particularly during the weekend, in sub-acute settings (18).

The 36-item Short Form Survey (27, 32, 34), the Australian Quality of Life scale (6), and the EuroQoL (5, 21, 28, 35, 37, 38) were used in ten trials to assess health-related quality of life. There was moderate quality evidence that additional physical therapy enhanced health-related quality of life by a small and significant amount (SMD 0.12, 95%CI 0.03 to 0.21, I2 0%) when compared to usual treatment in 10 trials with 1,899 individuals (figure 6). EQ-VAS rose by 2 points (MD 1.97, 95%CI 0.06 to 3.89, I2 0%) with additional physical therapy in a sub-group analysis of the trials that employed the EuroQoL Visual Analogue Scale. In a sensitivity analysis, the effect was greater (MD 4.6 points, 95%CI 0.92 to 8.28, I2 0%) when Peiris et al. (5) was eliminated because it accounts for more than 50% of the weight

In ten studies, adverse events were reported as present or absent (n=2071). Participants in the experimental group (n=1039) experienced 212 adverse events overall, while those in the control group (n=1032) experienced 224 adverse events. There was no difference in adverse outcomes across groups in nine trials. The group getting additional physical therapy experienced significantly fewer non-serious adverse events, according to one trial (25) (p=0.04).

There were 17 trials with published mortality rates (n=2749). In total, 21 people died in the control groups (total n=1361) and 23 people died in the experimental groups (total n=1388). Overall and in any study, there were no differences in deaths across groups (RR 1.07, 95%CI 0.6 to 1.93, p=0.8117). Six trials reported falls (n=1584). According to Bischoff-Ferrari (41) after a hip fracture, providing extra physical therapy considerably decreased the rate of falls by 25% (95%CI 1% to 44%) over the next 12 months. In the other trials, no group differences were found.

Discussion

Patients and health services benefit from more physical therapy since it shortens hospital stays and improves activity and participation metrics. These findings complement our earlier assessment by offering more conclusive proof of the advantages of offering patients with a variety of medical conditions additional physical therapy. In particular, this evaluation offers low to intermediate quality evidence to support the claims that more physical therapy treatments improve daily living activities, shorten hospital stays, enhance self-care skills, and improve quality of life.

Walking ability, a measure of body structure and function, did not show substantial increases, but assessments of daily living activities and self-care skills did. This may indicate that rather than focusing on particular bodily function metrics, the objectives of therapy in acute and subacute inpatient settings are frequently to enhance general functional ability to support safe discharge.

Overall length of stay was longer in the included trials done in sub-acute settings, which explains why differences in length of stay, reported as mean differences, were greater in sub-acute settings than in acute settings. However, compared to sub-acute settings, improvements in quality of life, self-care, and activities of daily living seemed to be greater in acute settings. The timing of the outcome assessment may help to explain this. Compared to one study in an acute situation (34), three of the studies in sub-acute settings (5, 21, 33) evaluated post-intervention outcomes at discharge instead of at a predetermined time. It would be expected that participants in both groups would attain a comparable sufficient level before being discharged, since the duration of stay and the time of discharge are frequently based on the functional level and capacity to perform self-care and activities of daily living. As a result, it would be anticipated that the results assessed at discharge would be comparable for each intervention group. It's possible that these trials were more effective at producing a comparable (or superior) degree of functional ability in a shorter amount of time.

The discovery that extra physical treatment was helpful offers circumstantial proof that physical therapy is a successful intervention for enhancing functional independence in daily living activities and self-care in individuals with a range of medical problems. It is challenging to identify the most effective component of physical therapy management, though, because the physical therapists in the included trials employed a variety of interventions and techniques that were not well documented in the trials and that are hard to explain (such as expert assessment, the delivery of multiple treatment intervention options, discharge planning, and education).

Measures of participation, aside from quality of life, were rarely reported. Evidence indicating more physical therapy enhanced quality of life was of moderate quality. In this systematic review, participation was represented by quality of life measures; however, quality of life measurements do not evaluate all aspects of involvement or only participation. Spending more time with therapists, which promotes overall social interaction and enjoyment (42) and may have impacted the anxiety and depression domains of quality of life, may therefore help to explain some of the improvements in quality of life. Furthermore, the majority of the trials in this evaluation employed functional domains in health-related quality of life measurements. Therefore, the mobility and self-care domains of the EuroQoL and other functional domains of health-related quality of life assessments will similarly be impacted by increases in functional independence. We could better understand how additional physical therapy affects involvement if we included more thorough measures of participation, including the Psychosocial Adjustment to Illness Scale (43), Life Habits, or the involvement Measure for Post-acute Care.

It might also be economical to provide extra physical therapy, as this has been shown to shorten hospital stays. This is a significant discovery because the expense of providing these services must be weighed against the advantages of offering more physical therapy. According to the one experiment in our review that conducted an economic analysis in addition to the randomized controlled trial, the group that received additional physical therapy saved an average of $1,673 each rehabilitation session. Further indicating that there may be health economic benefits despite the initial rise in expenses to increase therapy intensity, a systematic analysis (44) found cost reductions when comparing more intensive rehabilitation with usual care inpatient rehabilitation in a variety of populations.

All pertinent randomized controlled studies are included in the review, which is clinically feasible with an average of 12.2 minutes of physical therapy per patient each day. Future studies could look into the possibility of a dose-response link between patient and health care outcomes and the amount of physical therapy received. Managers might use this study to bolster their advocacy for more physical therapy services. Nevertheless, this evaluation does not address whether these programs should be offered more frequently on the weekends or more intensively throughout the week. Furthermore, even while we have some information about the extra therapy that was offered in the included studies, it does not indicate the ideal number of physical therapists in various settings and practice areas.

Conclusion

According to this systematic analysis, there is low to moderate evidence that giving adults more physical therapy can increase their involvement and activity levels while shortening their hospital stays. These advantages are probably safe, and there is some early indication that they might be economical, which would encourage managers and legislators to add more physical therapy services.

References:

1. Shaw, K. D., Taylor, N. F., & Brusco, N. K. (2013). Physiotherapy services provided outside of business hours in Australian hospitals: A national survey. Physiotherapy Research International, 18(2), 115–123.
2. Caruana, E., Kuys, S. S., Clarke, J., & Brauer, S. G. (2015). Weekend therapy service provision in a sample of rehabilitation facilities throughout Australia. Physiotherapy, 101(Supplement 1), e200–e201.
3. Carey, K. (2002). Hospital length of stay and cost: A multilevel modeling analysis. Health Services & Outcomes Research Methodology, 3(1), 41–56.

4. Peiris, C. L., Taylor, N. F., & Shields, N. (2011). Extra physical therapy reduces patient length of stay and improves functional outcomes and quality of life in people with acute or subacute conditions: A systematic review. Archives of Physical Medicine & Rehabilitation, 92(9), 1490–1500.
5. Peiris, C. L., Shields, N., Brusco, N. K., Watts, J. J., & Taylor, N. F. (2013). Additional Saturday rehabilitation improves functional independence and quality of life and reduces length of stay: A randomized controlled trial. BMC Medicine, 11, 198.
6. English, C., Bernhardt, J., Crotty, M., Esterman, A., Segal, L., & Hillier, S. (2015). Circuit class therapy or seven-day week therapy for increasing rehabilitation intensity of therapy after stroke (CIRCIT): A randomized controlled trial. International Journal of Stroke, 10(4), 594–602.
7. Guyatt, G., Oxman, A. D., Akl, E. A., Kunz, R., Vist, G., Brozek, J., Norris, S., Falck-Ytter, Y., Glasziou, P., De Beer, H., Jaeschke, R., Rind, D., Meerpohl, J., Dahm, P., & Schunemann, H. J. (2011). GRADE guidelines: 1. Introduction—GRADE evidence profiles and summary of findings tables. Journal of Clinical Epidemiology, 64(4), 383–394.
8. Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. BMJ, 339, b2535.
9. Higgins, J., & Green, S. (Eds.). (2009). Cochrane Handbook for Systematic Reviews of Interventions Version 5.0.2. The Cochrane Collaboration. Available at: www.cochrane-handbook.org. Accessed June 5, 2017.
10. Landis, R. J., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. Biometrics, 33(1), 159–174.
11. Anonymous. (2001). Who are physical therapists, and what do they do? Physical Therapy, 77, 1177–1187.
12. Centre for Evidence-Based Physiotherapy. (2010). The Physiotherapy Evidence Database (PEDro) [cited 2017 June 2]. Available from: www.pedro.org.au.
13. de Morton, N. A. (2009). The PEDro scale is a valid measure of the methodological quality of clinical trials: A demographic study. Australian Journal of Physiotherapy, 55(2), 129–133.
14. World Health Organisation. (2002). Towards a Common Language for Functioning, Disability and Health: ICF. Geneva: World Health Organisation.
15. Hozo, S. P., Djulbegovic, B., &Hozo, I. (2005). Estimating the mean and variance from the median, range, and the size of a sample. BMC Medical Research Methodology, 5(1), 13.
16. Cohen, J. (1962). The statistical power of abnormal-social psychological research: A review. Journal of Abnormal and Social Psychological Research, 65(3), 145–153.
17. Higgins, J., Thompson, S., Deeks, J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. British Medical Journal, 327(7414), 557–560.
18. Peiris, C. L., Taylor, N. F., & Shields, N. (2012). Additional Saturday allied health services increase habitual physical activity among patients receiving inpatient rehabilitation for lower limb orthopedic conditions: A randomized controlled trial. Archives of Physical Medicine & Rehabilitation, 93(8), 1365–1370.
19. Brusco, N. K., Watts, J. J., Shields, N., & Taylor, N. F. (2014). Are weekend inpatient rehabilitation services value for money? An economic evaluation alongside a randomized controlled trial with a 30-day follow-up. BMC Medicine, 12, 89.
20. Brusco, N. K., Watts, J. J., Shields, N., & Taylor, N. F. (2015). Is cost-effectiveness sustained after weekend inpatient rehabilitation? 12-month follow-up from a randomized controlled trial. BMC Health Services Research, 15, 165.
21. Brusco, N. K., Shields, N., Taylor, N. F., &Paratz, J. (2007). A Saturday physiotherapy service may decrease length of stay in patients undergoing rehabilitation in hospital: A randomized controlled trial. Australian Journal of Physiotherapy, 53(2), 75–81.
22. van der Peijl, I. D., Vliet Vlieland, T. P., Versteegh, M. I., Lok, J. J., Munneke, M., & Dion, R. A. (2004). Exercise therapy after coronary artery bypass graft surgery: A randomized comparison of a high and low frequency exercise therapy program. Annals of Thoracic Surgery, 77(5), 1535–1541.
23. Cavalcante, E. S., Magario, R., Conforti, C. A., Junior, G. C., Arena, R., Carvalho, A. C. C., et al. (2014). Impact of intensive physiotherapy on cognitive function after coronary artery bypass graft surgery. Arquivos Brasileiros de Cardiologia, 103(5), 391–397.
24. Smith, D. S., Goldenberg, E., Ashburn, A., Kinsella, G., Sheikh, K., Brennan, P. J., et al. (1981). Remedial therapy after stroke: A randomized controlled trial. British Medical Journal Clinical Research Ed., 282(6263), 517–520.
25. Bernhardt, J., Dewey, H., Thrift, A., Collier, J., & Donnan, G. (2008). A very early rehabilitation trial for stroke (AVERT): Phase II safety and feasibility. Stroke, 39(2), 390–396.

26. Donaldson, C., Tallis, R., Miller, S., Sunderland, A., Lemon, R., & Pomeroy, V. (2009). Effects of conventional physical therapy and functional strength training on upper limb motor recovery after stroke: A randomized phase II study. Neurorehabilitation & Neural Repair, 23(4), 389–397.
27. Fuller, L. M., Button, B., Tarrant, B., Steward, R., Bennett, L., Snell, G., et al. (2017). Longer versus shorter duration of supervised rehabilitation after lung transplantation: A randomized trial. Archives of Physical Medicine & Rehabilitation, 98(2), 220–226.e3.
28. Glasgow Augmented Physiotherapy Study Group. (2004). Can augmented physiotherapy input enhance recovery of mobility after stroke? A randomized controlled trial. Clinical Rehabilitation, 18(5), 529–537.
29. Lenssen, A. F., Crijns, Y. H., Waltje, E. M., van Steyn, M. J., Geesink, R. J., van den Brandt, P. A., et al. (2006). Efficiency of immediate postoperative inpatient physical therapy following total knee arthroplasty: An RCT. BMC Musculoskeletal Disorders, 7, 71.
30. Partridge, C., Mackenzie, M., Edwards, S., Reid, A., Jayawardena, S., Guck, N., et al. (2000). Is dosage of physiotherapy a critical factor in deciding patterns of recovery from stroke: A pragmatic randomized controlled trial. Physiotherapy Research International, 5(4), 230–240.
31. Martinsson, L., Eksborg, S., & Wahlgren, N. G. (2003). Intensive early physiotherapy combined with dexamphetamine treatment in severe stroke: A randomized, controlled pilot study. Cerebrovascular Diseases, 16(4), 338–345.
32. Craig, J., Young, C. A., Ennis, M., Baker, G., &Boggild, M. (2003). A randomized controlled trial comparing rehabilitation against standard therapy in multiple sclerosis patients receiving intravenous steroid treatment. Journal of Neurology, Neurosurgery & Psychiatry, 74(9), 1225–1230.
33. Slade, A., Tennant, A., & Chamberlain, M. A. (2002). A randomized controlled trial to determine the effect of intensity of therapy upon length of stay in a neurological rehabilitation setting. Journal of Rehabilitation Medicine, 34(6), 260–266.
34. Hirschhorn, A. D., Richards, D., Mungovan, S. F., Morris, N. R., & Adams, L. (2008). Supervised moderate-intensity exercise improves distance walked at hospital discharge following coronary artery bypass graft surgery: A randomized controlled trial. Heart, Lung & Circulation, 17(2), 129–138.
35. Calthorpe, S., Barber, E. A., Holland, A. E., Kimmel, L., Webb, M. J., Hodgson, C., et al. (2014). An intensive physiotherapy program improves mobility for trauma patients. Journal of Trauma & Acute Care Surgery, 76(1), 101–106.
36. Stockton, K. A., &Mengersen, K. A. (2009). Effect of multiple physiotherapy sessions on functional outcomes in the initial postoperative period after primary total hip replacement: A randomized controlled trial. Archives of Physical Medicine & Rehabilitation, 90(10), 1652–1657.
37. Kimmel, L. A., Liew, S. M., Sayer, J. M., & Holland, A. E. (2016). HIP4Hips (High Intensity Physiotherapy for Hip Fractures in the Acute Hospital Setting): A randomized controlled trial. Medical Journal of Australia, 205(2), 73–78.
38. Cooke, E. V., Tallis, R. C., Clark, A., & Pomeroy, V. M. (2010). Efficacy of functional strength training on restoration of lower-limb motor function early after stroke: Phase I randomized controlled trial. Neurorehabilitation and Neural Repair, 24(1), 88–96.
39. Richards, C. L., Malouin, F., Wood-Dauphinee, S., Williams, J. I., Bouchard, J. P., & Brunet, D. (1993). Task-specific physical therapy for optimization of gait recovery in acute stroke patients. Archives of Physical Medicine & Rehabilitation, 74(6), 612–620.
40. Lincoln, N. B., Parry, R. H., & Vass, C. D. (1999). Randomized, controlled trial to evaluate increased intensity of physiotherapy treatment of arm function after stroke. Stroke, 30(3), 573–579.
41. Bischoff-Ferrari, H. A., Dawson-Hughes, B., Platz, A., Orav, E. J., Stahelin, H. B., Willett, W. C., et al. (2010). Effect of high-dosage cholecalciferol and extended physiotherapy on complications after hip fracture: A randomized controlled trial. Archives of Internal Medicine, 170(9), 813–820.
42. Peiris, C. L., Taylor, N. F., & Shields, N. (2012). Patients value patient-therapist interactions more than the amount or content of therapy during inpatient rehabilitation: A qualitative study. Journal of Physiotherapy, 58(4), 261–268.
43. Resnick, L., & Plow, M. A. (2009). Measuring participation as defined by the international classification of functioning, disability and health: An evaluation of existing measures. Archives of Physical Medicine & Rehabilitation, 90(5), 856–866.
44. Brusco, N. K., Taylor, N. F., Watts, J. J., & Shields, N. (2014). Economic evaluation of adult rehabilitation: A systematic review and meta-analysis of randomized controlled trials in a variety of settings. Archives of Physical Medicine & Rehabilitation, 95(1), 94–116.e4.