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The Role of Occupational Therapy in the Care of Post-Thrombectomy Patients: A Narrative Review

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Abstract

Cerebrovascular accidents (CVA), also known as strokes, are the leading cause of neurological impairment in adults in the world. As a result, stroke treatments have evolved to reduce stroke-related disabilities in patients. The current standard of care includes mechanical thrombectomies for patients who qualify. Occupational therapy (OT) practitioners and other rehabilitation professionals are skilled at restoring function by adapting tasks and environments and remediating skills lost due to stroke. However, the role of OT practitioners in the care of post-thrombectomy patients is not well documented in the literature. This narrative review discusses the frequency and timing of OT services, as well as potential interventions used by OT practitioners with post-thrombectomy patients. Suggestions for future research, limitations of current literature, and limitations of the present paper are discussed.

Keywords: occupational therapy, thrombectomy, stroke rehabilitation

Background

Cerebrovascular accidents (CVA), also known as strokes, are the leading cause of neurological impairment in adults in the world (Feigin et al., 2017). When a patient presents to the hospital with stroke-like symptoms, there are many different treatment options, depending on the type of stroke and the duration of the symptoms. In the care of patients who have had a stroke, early intervention is crucial.

Currently, mechanical thrombectomies are the standard of care for patients who present to the hospital within 24 hours of symptom onset, and it involves a quick procedure in which a neurosurgeon removes a blood clot from a cerebral artery or vein (Oliveira-Filho & Samuels, 2022). Mechanical thrombectomies paired with medical management post-procedure are associated with lower incidences of disability after 3 months, compared to medical management alone, and earlier procedures are associated with better functional outcomes (Saver et al., 2016). These procedures are also associated with shorter hospital stays (Fuhrer et al., 2019), causing stroke rehabilitation hospitals worldwide to add these procedures to their services (Mathews & De Jesus, 2022). In 2018, the Joint Commission established a Thrombectomy-Capable Stroke Center certification program to designate hospitals that are capable of performing this service (Joint Commission, 2021). Hospitals who receive this designation perform mechanical thrombectomies 24 hours per day, 7 days per week, and have an acute stroke team present at bedside within 15 minutes (Joint Commission, 2021). In Michigan, where this narrative review took place, there are three Thrombectomy-Capable Stroke Centers (Michigan Department of Health and Human Services, 2021). Across the country, 44 hospitals are Thrombectomy-Capable Stroke Centers, and this number will likely grow as the procedure becomes more widely utilized (Baker et al., 2020).

Post-thrombectomy, a multidisciplinary rehabilitative care team is necessary, including occupational therapy (OT), physical therapy (PT), and speech therapy (ST) (Leslie-Mazwi et al., 2017). Due to the growing popularity of the thrombectomy procedure, it is important to understand the role that each member of the rehabilitation team has in recovery to minimize any complications. Potential complications post-thrombectomy include hemorrhages, reocclusion of the vessel, cerebral edema, and complications with the access site, typically the femoral artery (Krishnan et al., 2021). In this paper, I will discuss the role of OT in post-thrombectomy recovery.

Needs Assessment

With the growing prevalence of thrombectomies in stroke rehabilitation, the current practice guidelines for post-thrombectomy care do not include OT specifically (Jadhav et al., 2018; Leslie-Mazwi et al., 2017). Additionally, rehabilitation services are not always mentioned beyond early mobilization protocols, which are controversial in their effectiveness (Jadhav et al., 2018). For this reason, a review of the literature is warranted to determine the role of OT practitioners in the functional independence and mobility of these patients. This narrative review took place in a regional hospital in Michigan that performs thrombectomies but is not classified as a Thrombectomy-Capable Stroke Center. Much of the literature surrounding successful thrombectomies highlights a quick return to functional independence and increased use of upper extremities (Fuhrer et al., 2019; Pego Pérez et al., 2021). However, the literature surrounding the impact of the rehabilitation team, particularly OT practitioners, is less prevalent. Chang et al. (2020) noted that successful thrombectomies are associated with increased scores on functional measures such as the Barthel Index. However, the authors did not discuss the role that rehabilitation professionals have in maximizing functional outcomes (Chang et al., 2020).

Given OT practitioners' clear role in general stroke rehabilitation (AOTA, 2015), it is likely that the profession has a significant role post-thrombectomy as well. However, it is unclear whether there are certain precautions or considerations that OT practitioners need to be aware of with these patients and there is a paucity of literature reviews on this topic. The purpose of this narrative review is to investigate the available literature regarding the role of OT in stroke rehabilitation post-thrombectomy, and the interventions that OT practitioners commonly implement. The presence of this literature may reinforce the need for OT with this population and begin the discussion for formalized best practices to guide practitioners in their interventions.

Theoretical Base

The Occupational Therapy Intervention Process Model serves as a guide for this review as this model identifies the unique focus of OT in helping to restore function, which is the goal of this narrative review. According to Fisher (1998), OT practitioners utilize a top-down approach in four domains: "exercise, contrived occupation, therapeutic occupation, and adaptive occupation" (p. 509). The model also discusses the OT practitioner's role throughout the evaluation, intervention, and discharge process, including specific factors relating to the patient's personal context and the specifics of their diagnosis (Fisher, 1998). The model exemplifies the goal of this narrative review in delineating OT practitioners' unique role in the rehabilitation process, this review will specifically investigate the role of OT practitioners in the care of post-thrombectomy patients.

The Motor Learning frame of reference serves as a guide for this review as the goal is to determine the role of OT in post-thrombectomy recovery and, more specifically, the different tasks and interventions that are involved in regaining function. The ultimate goal of this frame of

reference is for patients to achieve recovery, where their post-stroke functioning is the same as their pre-stroke functioning (Cole & Tufano, 2008). Patients can achieve recovery through continuous practice of skills until a transfer of learning occurs, whereby the patient is able to perform tasks in a variety of environments (Cole & Tufano, 2008).

Methods

Given the wide scope of this review, articles met the inclusion criteria if they included OT or rehabilitation in their analyses of adult post-thrombectomy patients, or if they used an outcome measure used by OT practitioners (i.e. Barthel Index, Functional Independence Measure, AMPAC), and they must be written in English if they are international articles. Articles were excluded if they did not mention rehabilitation therapies, if they did not include patients received thrombectomies, or if they were below a Level IV evidence rating according to the Johns Hopkins Evidence-Based Practice Model (Johns Hopkins University School of Nursing, 2017). The aim of this paper is to review the available literature on OT's role in the care of post-thrombectomy patients, and the types of interventions used with these patients. Databases used for the article search included CINAHL, Medline, and Academic Search Complete databases, as well as Google Scholar. Filters included publications within the last 10 years, peer-reviewed articles, and articles in English. Keywords included "occupational therapy" and "thrombectomy", and "rehabilitation" and "thrombectomy". Thirty-one studies were included in the initial analyses with a full article review, and fourteen articles were included in the final analysis. Articles were then synthesized into an evidence chart and organized into themes for further discussion. See *Table 1.* for information on the articles retrieved.

Table 1

Articles Retrieved from Literature Search

Database Used	Keywords	Filters Used	Articles Remaining after Filters	Full-articles Reviewed	Articles Included in Appraisal
UIndy Library Database	"Occupational therapy" and "thrombectomy"	Last 10 years, peer-reviewed, English	14	4	3
UIndy Library Database	"Early mobilization" and "thrombectomy"	Last 10 years, peer-reviewed, English	24	2	2
Google Scholar	"Occupational therapy" and "thrombectomy"	Last 10 years, peer-reviewed, English	2,360	25	9

Note. One researcher participated in retrieving and appraising all articles.

Results

Fourteen articles were included in the final analysis discussing the role of OT in post-thrombectomy care. Five themes emerged from the analyzed articles: frequency and timing of OT services, OT as a part of the interdisciplinary care team, ADL independence after thrombectomy, upper extremity function after thrombectomy, and psychosocial symptoms after thrombectomy. See *Appendix A.* for a summary table of each article in terms of bias and quality of evidence.

Frequency and Timing of Occupational Therapy Services

Nine articles included in the final analysis discussed frequency and timing of OT services. This theme contained three articles of Level II evidence, five articles of Level III evidence, and one article of Level IV evidence, ranging from moderate to high quality (Johns

Hopkins University School of Nursing, 2017). Potential biases for this theme include small sample sizes, selection bias or missing information due to retrospective study designs, limited generalizability due to highly specialized study sites, and limited discussion of patients with poor outcomes. Frequency and timing of OT services are important clinical decisions in the rehabilitative care plan. Early mobilization is a program that encourages rehabilitation professionals to assist patients with out of bed activity early in the recovery process. O'Connor and colleagues (2019) conducted a retrospective case-control study in which one group received early mobilization and one group received routine treatment. The early mobilization group was seen by OT and PT an average of 16 hours sooner and their length of stay was over 1.5 days shorter than those with routine treatment (O'Connor et al., 2019). Burch and colleagues (2018) supported these findings by reporting that earlier evaluations from OT and physical therapy (PT) yielded higher functional scores on the Kansas University Hospital Physical Therapy Acute Care Functional Outcomes Tool in a population of 127 post-thrombectomy patients. Patients who did not receive OT and PT evaluations scored higher on the National Institute of Health Stroke Scale at discharge compared to those who did, indicating higher levels of functional independence in patients who were seen by rehabilitation professionals (Burch et al., 2018). Additionally, Thabet and colleagues (2015) recommended OT evaluations within 48 hours post-thrombectomy to determine discharge plans and any safety concerns that arise. These findings highlight the importance of early participation with therapy when working with post-thrombectomy patients. However, Stuchiner and colleagues (2019) found that mobilization within 24 hours with post-thrombectomy patients did not have a significant impact on 90-day outcomes.

Regarding frequency, there is evidence that intensive rehabilitation is effective in improving functional outcomes (Belgaje et al., 2014). Researchers conducted a study in which

participants in skilled nursing facilities (SNF) and inpatient rehabilitation facilities (IRF) with similar medical comorbidities were compared based on their functional outcomes. Researchers found that patients discharged to a SNF were less likely to achieve a good outcome compared to those discharged to IRFs, with 25% of patients in SNFs and 46% in IRFs achieving good outcomes (Belgaje et al., 2014). Chiu and colleagues (2021) reaffirmed the idea that early and intensive rehabilitation yields more favorable outcomes by comparing a group of patients that did not receive acute rehabilitation with a group that did. Those who received acute rehabilitation experienced shorter stays in the hospital and were able to transfer to intensive inpatient rehabilitation facilities more quickly (Chiu et al., 2021).

Occupational Therapy as a Part of the Interdisciplinary Care Team

Four articles included in the final analysis discussed OT as a part of the interdisciplinary care team. This theme contained four articles of Level II evidence ranging from moderate to high quality (Johns Hopkins University School of Nursing, 2017). Potential biases for this theme include small sample sizes, selection bias due to retrospective study designs, limited generalizability due to highly specialized study sites, and a limited discussion of patients with poor outcomes. OT is an established profession in stroke rehabilitation, including after endovascular treatments including thrombectomies (Leslie-Mazwi et al., 2017). Leslie-Mazwi and colleagues (2017) emphasized the importance of OT evaluations in their practice guidelines for neuroradiologists, neurologists, and neurointerventionalists working with post-thrombectomy patients. Specifically, researchers stated that all post-thrombectomy patients should be seen by an interdisciplinary rehabilitation team, including OT, PT, and speech therapy, while in the acute care setting (Leslie-Mazwi et al., 2017). In multidisciplinary practice guidelines created by the Society for NeuroInterventional Surgery, Pierot and colleagues (2018) restated the role of OT in

the care of the post-thrombectomy patient, specifically in rehabilitating the patient and assisting with community reintegration following discharge. The two practice guidelines shared the belief that an OT practitioner should, at minimum, evaluate the patient acutely to identify barriers for safety at discharge, and ideally provide intensive rehabilitation services post-thrombectomy (Leslie-Mazwi et al., 2017; Pierot et al., 2018). However, researchers stated that more research is needed on this topic since the widespread usage of mechanical thrombectomies is still relatively new (Pierot et al., 2018).

Chiu and colleagues (2021) emphasized the importance of OT practitioners and the rest of the rehabilitative care team in ensuring favorable outcomes. Researchers found that a cohesive rehabilitation care team is essential to establishing a care plan for patients to support a safe discharge to the community (Chiu et al., 2021). Chu and colleagues (2020) supported the recommendation for a comprehensive rehabilitation team including OT. Specific recommendations for OT interventions included posture training, transfer training, ADL training, cognitive training, and constraint-induced movement therapy (Chu et al., 2020).

Reuter and colleagues (2016) reported a 30% undersupply of OT practitioners in a large hospital network in Germany, which has implications for stroke rehabilitation. The result of this is that patients with either very favorable or very unfavorable outcomes are less likely to receive OT in an attempt to optimize resources when there is a shortage of practitioners (Reuter et al., 2016). Specifically, stroke patients with a modified Rankin score from two to five at discharge received the highest number of therapy sessions compared to patients who fully recovered or died in the hospital (Reuter et al., 2016).

ADL Independence After Thrombectomy

Four articles included in the final analysis discussed ADL independence after thrombectomy. This theme contained one article of Level I evidence, one article of Level II evidence, and two articles of Level III evidence ranging from moderate to high quality (Johns Hopkins University School of Nursing, 2017). Potential biases for this theme include small sample sizes, selection bias due to retrospective study designs, limited generalizability due to highly specialized study sites, and participant attrition due to changes in neurological status. Maximizing intervention time by focusing on high-value interventions is crucial. According to Aoki and colleagues (2019), an early focus on training in activities of daily living (ADLs) and swallowing function during feeding is fundamental to ensuring safe discharges to the home setting. Since OT practitioners are skilled in providing intervention surrounding ADLs, they are a valuable component of the multidisciplinary rehabilitation team and supporting independence at discharge.

Independence in ADLs is crucial for a safe discharge home, as patients need to take care of themselves or have the support at home to complete these tasks. Reverté-Vallarroya and colleagues (2020) found that thrombectomy treatments compared to best medical treatment yielded increased functional independence, as evidenced by scores on the Barthel Index three months post-stroke. Researchers also identified significantly greater improvements in scores on the National Institute of Health Stroke Scale, modified Rankin Scale, and Stroke Impact Scale after three months in the thrombectomy group (Reverté-Villarroya et al., 2020). A major limitation of this study was the lack of discussion on rehabilitation professionals' role in these improvements. It is unclear whether OT practitioners were involved during the participants'

hospital stay, but it is possible due to the use of the Barthel Index as an outcome measure, a commonly used OT assessment for ADL independence (Reverté-Villarroya et al., 2020).

Belgaje and colleagues (2014) advocated for the implementation of intensive therapies post-thrombectomy due to their impact on return to ADL independence during recovery. Researchers attributed good outcomes to the presence of intensive rehabilitation services, including OT, PT, speech therapy, and physical medical and rehabilitation physicians (Belgaje et al., 2014). Chiu and colleagues (2021) supported these findings by highlighting the impact that post-acute care rehabilitation has on functional outcomes, especially Instrumental Activities of Daily Living (IADLs). Patients that received post-acute care rehabilitation improved significantly more in all functional outcomes including ADL performance, oral intake, cognitive function, IADLs, quality of life, and balance, compared to those who did not receive post-acute care rehabilitation (Chiu et al., 2021).

Upper Extremity Function After Thrombectomy

Two articles included in the final analysis discussed upper extremity function after thrombectomy. This theme contained two articles of Level III evidence, both of moderate quality (Johns Hopkins University School of Nursing, 2017). Potential biases for this theme include small sample sizes and selection bias due to retrospective study designs. A necessary component of ADL training post-stroke is increasing function and involvement of the affected upper extremity. Branco and colleagues (2021) recommend a variety of interventions for OT practice including bimanual coordination, mirror therapy, transcranial magnetic stimulation, and constraint-induced movement therapy if appropriate. Researchers emphasized the importance of therapeutic intervention in the first twelve weeks post-stroke, the period of time in which the most functional gains typically occur (Branco et al., 2021). Additionally, those who underwent a

successful mechanical thrombectomy demonstrated greater improvements than those who did not (Branco et al., 2021). Conversely, Tokuda and colleagues (2021) found no significant differences in improvements in upper extremity function between patients who underwent mechanical thrombectomy and patients who did not. However, both groups demonstrated significant gains in upper extremity function according to the Fugl-Meyer Assessment following 20-40 minute sessions with OT five to six times per week for approximately six weeks (Tokuda et al., 2021).

Psychosocial Symptoms After Thrombectomy

Two articles included in the final analysis discussed psychosocial symptoms after thrombectomy. This theme contained one article of Level I evidence and one article of Level IV evidence, both of moderate quality (Johns Hopkins University School of Nursing, 2017). Potential biases for this theme include a lack of appraisal of articles reviewed by Thabet et al. (2015) and participant attrition due to changes in neurological status. Psychosocial concerns post-stroke are another common place for rehabilitation professionals to assess and intervene. According to Thabet and colleagues (2015), 30% of post-stroke patients may experience symptoms of depression, requiring the need for skilled intervention. Researchers also stated that this is within the scope of rehabilitation professionals including OT practitioners (Thabet et al., 2015). Regarding interventions, one study compared health related quality of life (HRQoL) and coping strategies between post-thrombectomy patients and patients who received “best medical treatment” (Reverté-Villarroya et al., 2020). Researchers found that HRQoL was higher among the post-thrombectomy patients and the “best medical treatment group” demonstrated higher levels of coping skills (Reverté-Villarroya et al., 2020). However, Reverté-Villarroya and colleagues (2020) discussed how this may be because post-thrombectomy patients are not required to develop coping skills due to their quick functional improvements. Nevertheless,

coping skills, specifically problem-based coping skills, are important for approaching and overcoming challenges related to potential post-stroke deficits, and should be addressed by rehabilitation professionals when assessing for safety upon discharge from the hospital (Reverté-Villarroya et al., 2020).

Discussion

Since thrombectomies are the standard of care currently (Oliveira-Filho & Samuels, 2022), it is essential that the role of each healthcare professional is clearly delineated. As outlined in this paper, OT practitioners and rehabilitation professionals in general have a large role in the care of post-thrombectomy patients. With the growing amount of literature on the effectiveness of thrombectomies in stroke treatment, further delineation of OT's specific role in their rehabilitation post-operation is warranted. The analyzed studies discussed the role of OT in the care of post-thrombectomy patients and delineated some common interventions or assessments. The findings of the discussed studies have multiple implications for OT practice. First, there was a consensus among the studies that frequent OT intervention is indicated for a return for functional independence (Thabet et al., 2015; Burch et al., 2018; O'Connor et al., 2019), however the impact of earlier evaluations on functional outcomes is inconsistent (Stuchiner et al., 2019). The importance of high frequency interventions places a greater role on the OT practitioner and other rehabilitation professionals to advocate for IPR placements for these patients (Beljage et al., 2014; Chu et al., 2020; Chiu et al., 2021). Second, OT practitioners should focus on ADL training, UE strengthening and coordination, and discussions surrounding coping and mental health in their interventions (Aoki et al., 2019; Reverté-Vallarroya et al., 2020; Branco et al., 2021; Tokuda et al., 2021). The OT interventions discussed in the analyzed studies are congruent with current practice guidelines for stroke rehabilitation in general (AOTA,

2015). In practice, OT practitioners should pay close attention to the precautions and guidelines provided by the endovascular neurosurgeon, while utilizing current best practices for stroke rehabilitation with post-thrombectomy patients.

Limitations

One common limitation to the articles analyzed was that many of them were retrospective studies (*n= 7*), so the researchers had no control over the treatment protocols given to their participants. Very few studies (*n= 3*) had a control group. Only one study included randomization in their study design. Small sample sizes also limited several of the discussed studies (*n= 5*).

The present paper has limitations. First, only one researcher reviewed and selected each article, leaving room for potential selection bias. To limit this bias, I used guidelines from the Johns Hopkins University School of Nursing (2017) to appraise articles. However, bias may still exist. Second, due to the limited literature available on the topic, the inclusion criteria widened after the search process began. This resulted in the inclusion of articles that may not describe OT in detail but may have discussed concepts associated with OT, including ADLs and functional independence. A common limitation with narrative reviews in general is a lack of systematic methods relating to the acquisition of articles (Pae, 2015). However, this paper utilized recommendations from Green et al. (2006) which describes a systematic protocol for searching for and reviewing articles, including using a variety of databases and clearly outlining all methods.

Future Research

Due to the limitations of the discussed studies, more research is needed to solidify the role of OT in the care of post-thrombectomy patients. The benefit of OT with post-

thrombectomy patients is not fully understood and the profession would benefit from further investigation. Specifically, information regarding the efficacy of high value interventions is largely missing from the literature currently. With a deeper understanding of the interventions that yield the highest functional improvements, practice guidelines for OT practitioners can be established. Future research should specifically include randomized controlled trials in their methodology in order to provide consistent, high-level evidence pertaining to the timing, frequency, and focus of OT interventions.

Conclusion

OT practitioners play an important role in the care of post-thrombectomy patients. The current literature has some significant gaps regarding the specific interventions for post-thrombectomy patients and the efficacy of those interventions. With the prevalence of strokes projected to continue increasing (Kuriakose & Xiao, 2020), understanding the role of rehabilitation professionals after stroke treatment is crucial. Current literature discusses the benefits of early, high frequency, high intensity rehabilitation targeting ADLs and upper extremity function. OT practitioners can use this information to maximize interventions and restore function in patients.

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Saver, J. L., Goyal, M., Van der Lugt, A. A. D., Menon, B. K., Majoie, C. B., Dippel, D. W., Campbell, B.C., Nogueira, R.G., Demchuk, A.M., Tomasello, A., Cardona, P., Devlin, T.G., Frei, D.F., de Rochemont, R.D.M., Berkhemer, O.A., Jovin, T.G., Siddiqui, A.H., van Zwam, W.H., ... & HERMES Collaborators. (2016). Time to treatment with

endovascular thrombectomy and outcomes from ischemic stroke: A meta-analysis. *JAMA*, *316*(12), 1279-1289.

Stuchiner, T. L., Clark, D., Lucas, L., Robison, J., & Yanase, L. (2019). Abstract TP380: Impact of early mobilization on 90-day outcomes in thrombectomy patients. *Stroke, 50*(Suppl_1). https://doi.org/10.1161/str.50.suppl_1.tp380

Thabet, A., Josephson, S., & Meisel, K. (2015). Acute care of ischemic stroke patients in the hospital. *Seminars in Neurology, 35*(06), 629–637. https://doi.org/10.1055/s-0035-1564301

Tokuda, K., Takebayashi, T., Koyama, T., Fujita, T., Hanada, K., & Okita, Y. (2021). Effects of mechanical thrombectomy for post-stroke patients with upper limb hemiparesis: Use of propensity score matching. *Clinical Neurology and Neurosurgery*, *202*, 106520. https://doi.org/10.1016/j.clineuro.2021.106520

Appendix A: Evidence Table

Citation	Participants	Type of Study	Methods	Results	Weaknesses/ Limitations	Level and Quality of Evidence
Aoki, K., Suzuki, H., Miyata, T., Ogino, T., & Iguchi, A. (2021). Predictors of discharge outcomes following percutaneous mechanical thrombectomy in patients with acute ischemic stroke: Comparisons between the Home Discharge Group and Hospital Transfer Group. *The Showa University Journal of Medical Sciences, 33*(1), 9–14. https://doi.org/10.15369/sujms.33.9	111 thrombectomy patients who received therapy within 3 days post-op.	Retrospective study	Information about independence was retrieved using Brunstromm Recovery Stages, FIM, oral intake, and Glasgow Coma Scale. Dependent variables were home discharge and hospital transfer. Independent variables were scores on BRS, FIM, GCS, and oral intake.	Oral intake and grooming independence was associated with home discharges. Early intervention in feeding and other ADLs is crucial for increased functional indpendence and a home discharge as opposed to hospital transfer.	Retrospective study	Level III, High Quality
Belagaje, S. R., Sun, C.-H. J., Nogueira, R. G., Glenn, B. A., Wuermser, L. A., Patel, V., Frankel, M. R., Anderson, A. M., Thomas, T. T., Horn, C. M., & Gupta, R. (2014). Discharge disposition to skilled nursing facility after endovascular reperfusion therapy predicts a poor prognosis. *Journal of NeuroInterventional Surgery, 7* (2), 99–103. https://doi.org/10.1136/neurintsurg-2013-011045	147 stroke patients who received endovascular treatment.	Prospective observational study	Data was obtained from patients including discharge disposition, NIHSS, totaled health risks in vascular events (THRIVE), Houston Intra-Arterial Therapy 2 (HIAT-2), and Acute Physiology and Chronic Health Evaluation (APACHE II) scores. Information was assessed to see the impact of discharge disposition (independent variable) on clinical outcome (mRS score, dependent variable), with a score of 2 or less indicating good outcome.	Final infarct volumes, APACHE II, THRIVE, and HIAT-2 scores were similar between those discharged to IPR and SNF, but their 90-day outcomes were different. 25% of SNF patients and 46% of IPR patients achieved a good outcome (p=0.023).	Retrospective study, small sample size	Level III, Moderate Quality
Branco, J. P., Rocha, F., Sargento-Freitas, J., Santo, G. C., Freire, A., Laíns, J., & Páscoa Pinheiro, J. (2021). Impact of post-stroke recanalization on general and upper limb functioning: A prospective, observational study. *Neurology International, 13*(1), 46–58. https://doi.org/10.3390/neurolint13010005	98 AIS patients undergoing rehabilitation including 60 min of PT, 30 min of OT, and 30 min of speech if aphasia was present.	Prospective observational study	OT interventions included bimanual coordination, mirror therapy, constraint induced movement therapy, and transcranial magnetic stimulation.	The patients in this study who received therapeutic recanalization (thrombectomy) had improved upper limb functioning compared to those with spontaneous recanalization. Therapeutic recanalization was also much more successful at achieving recanalization compared to spontaneous.	Small sample size	Level II, Moderate Quality
Burch, D., Drake, A., Steuber, T., Nihart, J., Abner, E., Stafford, W. L., & Fraser, J. (2018). Abstract TP157: Patient and physical therapy/occupational therapy characteristics associated with functional mobility outcomes after mechanical thrombectomy. *Stroke, 49* (Suppl_1). https://doi.org/10.1161/str.49.suppl_1.tp157	127 patients who underwent mechanical thrombectomy.	Retrospective review	Collected information included National Institute of Health Stroke Scale (NIHSS), ICU/hospital length of stay, functional status (Kansas score), timing of PT/OT evaluation, and number of PT/OT sessions. Dependent variables were NIHSS scores, length of stay, and Kansas scores. Independent variables were timing of PT/OT evaluation and number of PT/OT sessions.	Earlier PT/OT evaluations were associated with higher Kansas scores.	Retrospective study	Level III, Moderate Quality
Chiu, C.C., Wang, J.J., Hung, C.M., Lin, H.F., Hsien, H.H., Hung, K.W., Chiu, H.C., Jennifer Yeh, S.C., & Shi, H.Y. (2021). Impact of multidisciplinary stroke post-acute care on cost and functional status: A prospective study based on propensity score matching. *Brain Sciences, 11*(2), 161. https://doi.org/10.3390/brainsci11020161	910 patients who experienced a stroke. 455 received post acute care rehab, 455 did not.	Prospective cohort study	PAC group received OT, PT, and ST once per day prior to admission to an IRF. Outcomes assessed were estimation of cost, functional status with Barthel Index (BI), Functional Oral Intake Scale (FOIS), Mini-Mental State Examination (MMSE), Instrumental Activities of Daily Living Scale (IADL), EuroQoL Quality of Life Scale (EQ5D), and Berg Balance Scale (BBS). Dependent variable was cost estimation and functional status. Independent variable was PAC or non PAC group.	PAC group improved significantly in all functional outcome measures, with great improvements compared to the non PAC group. Medical costs were significantly lower for the PAC group compared to non PAC.	Location of study was highly specialized	Level II, High Quality
Chu, C.L., Chen, Y.P., Chen, C.C.P., Chen, C.K., Chang, H. N., Chang, C.H., & Pei, Y.C. (2020). Functional recovery patterns of hemorrhagic and ischemic stroke patients under Post-Acute Care Rehabilitation program. *Neuropsychiatric Disease and Treatment, 16*, 1975–1985. https://doi.org/10.2147/ndt.s253700	489 stroke patients. 12 of which underwent thrombectomy.	Retrospective study	All patients were in the post acute care rehabilitation program. Functional outcome measures included modified Rankin Scale (mRS), Barthel Index (BI), Functional Oral Intake Scale (FOIS), Mini-Nutritional Assessment (MNA), European quality of life five dimension questionnaire (Euro-QoL-5D), Instrumental activities of daily living scale (IADL), Berg Balance Scale (BBS), gait speed, 6-min walk test (6-MWT), Fugl-Meyer assessment [FuglMeyer upper extremity assessment (FuglUE), modified Fugl-Meyer sensory assessment (FuglSEN)], Mini-Mental State Examination (MMSE), Motor Activity Log amount of use (MAL-quantity), Motor Activity Log quality of use (MAL quality), and Concise Chinese aphasia test (CCA).	OT consisted of posture training, transfers, ADL, cognitive training, constraint-induced movement therapy.	Selection bias, unable to generalize to general stroke pop	Level III, Moderate Quality

Leslie-Mazwi, T., Chen, M., Yi, J., Starke, R. M., Hussain, M. S., Meyers, P. M., McTaggart, R. A., Pride, G. L., Ansari, S. A., Abruzzo, T., Albani, B., Arthur, A. S., Baxter, B. W., Bulsara, K. R., Delgado Almandoz, J. E., Gandhi, C. D., Heck, D., Hetts, S. W., Klucznik, R. P., … Fraser, J. F. (2017). Post-thrombectomy management of the Elvo Patient: Guidelines from the Society of Neurointerventional Surgery. *Journal of NeuroInterventional Surgery, 9* (12), 1258–1266. https://doi.org/10.1136/neurintsurg-2017-013270	Papers discussing the treatment protocols of emergent large vessel occlusion (ELVO) patients post thrombectomy.	Systematic review, practice guidelines	Researchers evaluated the results of RCTs and other relevant literature related to the care of ELVO patients. Researchers included a multidisciplinary board of practitioners related to stroke rehabilitation. After reviewing the articles, the board gave their recommendations in the form of practice guidelines.	All patients need to have an assessment from PT, OT, and ST within the first 24-36 hours of admission.	Did not discuss post-thrombectomy patients with poor outcomes	Level II, High Quality
O'Connor, K., Frazure, A., Campbell, M., Polly, M., Reckner, K., & Lee, J. D. (2019). Abstract TP345: Early mobilization following recombinant tissue plasminogen activator administration and/or mechanical thrombectomy reduces length of stay. *Stroke, 50*(Suppl_1). https://doi.org/10.1161/str.50.suppl_1.tp345	190 patients with acute ischemic stroke who received IV rt-PA and/or underwent mechanical thrombectomy.	Retrospective case control study	Group 1 was maintained on bedrest for 24 hours post rt-PA. Group 2 was exposed to early mobilization protocols based on NIHSS score, presence of aphasia, whether or not they had a thrombectomy, and their other clinical factors. Dependent variable was length of stay and time to assessment post-op. Indepedent variable was whether or not they received early mobilization.	The presence of early mobilization protocols (Group 2) was associated with shorter length of stays (6 days vs. 4.42 days) and decreased time to PT/OT evaluation (38 hours 55 min vs 22 hours 29 minutes). No adverse events related to early mobilization were found in Group 2.	Retrospective study	Level III, High Quality
Pierot, L., Jayaraman, M. V., Szikora, I., Hirsch, J. A., Baxter, B., Miyachi, S., Mahadevan, J., Chong, W., Mitchell, P. J., Coulthard, A., Rowley, H. A., Sanelli, P. C., Tampieri, D., Brouwer, P. A., Fiehler, J., Kocer, N., Vilela, P., Rovira, A., Fischer, U., … Karel, T. (2019). Standards of practice in acute ischemic stroke intervention: International recommendations. *Interventional Neuroradiology, 25*(1), 31–37. https://doi.org/10.1177/1591019918800457	Papers discussing intervention guidelines for acute ischemic stroke. Researchers paid special attention to literature surrounding thrombectomies and practice guidelines surrounding post-thrombectomy care.	Systematic review, practice guidelines	Researchers from multiple countries reviewed articles and reached a consensus on practice guidelines for interventions with AIS patients.	Stroke treatments once thought to be the gold standard, including tissue plasminogen activator (tPA), are now known to be less effective in AIS. Rather, mechanical thrombectomies are proving to be much more beneficial and leading to improved outcomes. For this reason, the paper gives guidelines for proper protocols in AIS populations, including an emphasis on the inclusion of a comprehensive rehabilitation team, including occupational therapy practitioners.	Further research needed to validate studies since short period of time since MT became widespread	Level II, High Quality

Reuter, B., Gumbinger, C., Sauer, T., Wiethölter, H., Bruder, I., Diehm, C., Ringleb, P. A., Hacke, W., Hennerici, M. G., & Kern, R. (2016). Access, timing and frequency of very early stroke rehabilitation – insights from the Baden-Wuerttemberg Stroke Registry. *BMC Neurology, 16*(1). https://doi.org/10.1186/s12883-016-0744-7	99,753 IS patients including some patients who were treated with mechanical thrombectomy.	Retrospective study	Researchers accessed when the first contact with a therapist happened and the average number of therapy sessions during the first week of admission (independent variable). mRS was used as outcome measure (dependent variable).	There is a 30% undersupply of OT in stroke rehabilitation. Therapists were more likely to see patients with a discharge mRS of 2-5, and less likely to see patients with a complete recovery at discharge or death during hospitalization.	No quantitative or qualitative info on length of sessions or type of sessions was available. Missing data on functional level at admission for some patients. Retrospective study.	Level III, High Quality
Reverté-Villarroya, S., Dávalos, A., Font-Mayolas, S., Berenguer-Poblet, M., Sauras-Colón, E., López-Pablo, C., Sanjuan-Menéndez, E., Muñoz-Narbona, L., & Suñer-Soler, R. (2020). Coping strategies, quality of life, and neurological outcome in patients treated with mechanical thrombectomy after an acute ischemic stroke. *International Journal of Environmental Research and Public Health, 17*(17), 6014. https://doi.org/10.3390/ijerph17176014	82 ischemic stroke patients. 42 undergoing EVT and 40 undergoing "best medical treatment"	Randomized prosepctive, longitudinal, and comparative study	Measures used included the Brief Coping Questionnaire, NIHSS, Barthel Index, Modified Rankin Scale, Stroke Impact Scale, and the EuroQoL. Dependent variables were the previously mentioned measures. Independent variable was whether they received EVT or BMT.	EVT and BMT patients presented with similar coping strategies after 3months, but BMT showed significantly better coping strategies after 1year. Problem-focused coping strategies are associated with better stroke recovery, as demonstrated in the BMT group. EVT was associated with HRQoL as well as better neurological and functional scores.	"Neurological status led to a loss of follow up"	Level I, Moderate Quality
Stuchiner, T. L., Clark, D., Lucas, L., Robison, J., & Yanase, L. (2019). Abstract TP380: Impact of early mobilization on 90-day outcomes in thrombectomy patients. *Stroke, 50*(Suppl_1). https://doi.org/10.1161/str.50.suppl_1.tp380	91 thrombectomy patients who were mobilized within 24hours.	Retrospective cohort study	Functional outcomes after 90 days were assessed using the mRS, categorized as no symptoms or no significant disability (0-1), mild to moderate disability (2-3), and severe disability or death (4-6). Dependent variable was mRS score at 90 days. Independent variable was the time of mobilization by hour after thrombectomy.	Early mobilization (within 24 hours) did not have an impact on outcomes at 90 days post-thrombectomy.	Small sample size, retrospective study	Level III, Moderate Quality

Thabet, A., Josephson, S., & Meisel, K. (2015). Acute care of ischemic stroke patients in the hospital. *Seminars in Neurology, 35*(06), 629–637. https://doi.org/10.1055/s-0035-1564301	Review of current care considerations for post-stroke patients in acute care.	Practice guidelines	Does not provide information on how they acquired articles.	Patients should be seen by OT within 2 days post-thrombectomy. OT should assess ADL function and all rehab professionals should assess for depression, since 30% of post-stroke patients experience symptoms of depression.	No appraisal of articles	Level IV, Moderate Quality
Tokuda, K., Takebayashi, T., Koyama, T., Fujita, T., Hanada, K., & Okita, Y. (2021). Effects of mechanical thrombectomy for post-stroke patients with upper limb hemiparesis: Use of propensity score matching. *Clinical Neurology and Neurosurgery, 202*, 106520. https://doi.org/10.1016/j.clineuro.2021.106520	48 patients, 24 in the control group and 24 in the treatment group. Treatment group underwent mechanical thrombectomy.	Case control study, w/ control group but no randomization	All participants were given 20-40 minutes each of OT, PT, and ST five to six times per week. Interventions focused on ADL training and functional tasks.	Both groups improved UE function significantly.	Small sample size, selection bias d/t no randomization, retrospective study	Level III, Moderate Quality

Appendix B: DCE Weekly Planning Guide

Week	DCE Stage (orientation, screening/ evaluation, implementation, discontinuation, dissemination)	Weekly Goal	Objectives	Tasks	Date complete
1	**Orientation**	1) Complete orientation by the end of the week	Meet with site mentor and OT staff.	Attend morning huddle meetings to learn about how the OT staff functions.	1/10
			Begin to shadow OTs to meet patients and educate them on the goal of my DCE.	Ensure all paperwork for orientation is complete.	1/10
				Tour the facility	1/11
				Observe team meeting with various departments	1/10
	Screening/ Evaluation	2) Complete Needs Assessment by the end of the week	Begin looking into resources provided by the site for patient handouts.	Determine what resources to focus on during DCE.	1/13
			Finalize questions for Needs Assessment	Ask site mentor Needs Assessment questions	1/13
2	**Screening/ Evaluation**	1) Begin faceted search for narrative review	Select databases to use	Search databases and determine which ones are appropriate for finding articles regarding OTs	1/21

				role with post-thrombectomy patients.	
		2) Update MOU	Determine specifics for updated project and experience.	Discuss needs established with site mentor from last week, and determine goals for project and experience.	1/17
		3) Conduct needs assessment with OT staff	Determine usage of patient binders by OT staff	Create and disseminate survey	1/18
3	**Screening/ Evaluation**	1) Conduct literature search	Determine inclusion and exclusion criteria of articles	Document inclusion and exclusion criteria	1/26
		2) Conduct needs assessment with OT staff	Determine usage of patient binders by OT staff	Analyze responses from survey (ongoing)	1/24-2/10
4	**Implementation**	1) Continue literature search	Determine quality and level of evidence found	Analyze articles using John Hopkins tool	2/3
				Synthesize articles using evidence chart	2/3
		2) Begin interdisciplinary outreach	Seek PT and SLP feedback with survey	Attend PT huddle to educate about survey	2/1
		3) Continue working with		Begin looking into resources that	1/31

		the patient binder		need to be updated in the patient binder Begin updating resources	2/2
5	**Implementation**	1) Continue working with patient binder 2) Determine OTs role in care of post-thrombectomy patients at site. 3) Consolidate information gathered from survey	Get feedback from neuro team on therapies	Continue updating resources Set up meeting with neurosurgery team Attend meeting with neurosurgery team Finish presentation with information from survey	2/11 2/8 2/10 2/11
6	**Implementation**	1) Consolidate information gathered from neuro team 2) Consolidate information from updated patient handouts 3) Share survey results	Prepare for meeting next week with therapy team	Create presentation with information on thrombectomy update Organize handouts with folders for before and after to present to OT team next week Meet with DOR to discuss survey results	2/18 2/18 2/18
7	**Implementation**	1) Continue work on narrative review		Finish introduction/ background section	2/25

		2) Evaluate progress on patient handouts and patient binders	Present updates to OT team	Attend team meeting and present handouts	2/23
8	**Implementation**	1) Continue work on patient binders 2) Seek final feedback on handout updates	Clarify schedule sheet on front of binders	Create updated schedule sheet Present updated schedule sheet to OTs Pass folder with updated handouts around in the OT offices to obtain feedback (ongoing)	2/28 3/2 2/28-3/13
9	**Implementation**	1) Continue work on narrative review 2) Begin presentation for OT role in post-thrombectomy patients 3) Continue research on thrombectomies at my site	Research leading hospitals for thrombectomies	Complete methods section Find template for narrative review presentation Create outline for presentation Email neurosurgery PA to ask about plans for the stroke center's growth	3/8 3/7 3/8 3/7
10	**Implementation**	1) Continue narrative review presentation 2) Edit narrative		Finish background slide in presentation. Double check guidelines for reporting results	3/16 3/15

		review as needed 3) Continue updates to patient handouts	Take in feedback from therapists on handouts	from narrative review. Decide what changes are necessary Make updates to patient handouts with guidance from therapists' feedback.	3/14 3/17
11	**Discontinuation**	1) Finalize handouts 2) Get more experience with patient care	Prepare handouts for the file cabinet Identify therapists to shadow	Place an order with the printing company Shadow therapists/assist with treatments	3/23 3/24 & 3/25
12	**Discontinuation**	1) Finalize narrative review presentation 2) Finish full draft of narrative review	Prepare paper to send to Katie for review	Finish all slides for site mentor review next week Finish abstract Finish conclusion Finish results (Attend AOTA Conference)	3/29 3/28 3/29 3/28 3/30-4/3
13	**Dissemination**	1) Continue review process of narrative review paper 2) Disseminate patient handouts	Receive feedback from faculty mentor Finalize file cabinet	Send draft to Katie for review Receive handouts from printing company	4/5 4/4

		3) Finalize presentation for OTs		Organize final handouts in file cabinet Send presentation to site mentor for review Discuss edits for presentation with site mentor Add personal/professional takeaways from DCE experience Send presentation to site mentor for dissemination	Began 4/5 4/4 4/5 4/6 4/7
14	**Dissemination**	1) Continue dissemination of patient handouts 2) Disseminate presentation to OTs 3) Shadow OTs	Gain clinical experience in acute/ IPR settings	Finish organizing file cabinet Site mentor will send presentation to OTs Shadow on ortho floor Shadow on surgical floor	4/14 4/11 4/11, 4/12, 4/15 4/13