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Effect of Very Early Mobilisation (VEM) on the Level of Disability Following Acute Stroke

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Abstract – Changes in stroke care around the world have been influenced by evidence that structured stroke-unit care resulted in a better outcome. Stroke rehabilitation should begin as soon as feasible in order to maximise recovery. Debate rages about how early rehabilitation should begin. It is common practise in many Scandinavian hospitals to get patients out of bed as soon as possible after a stroke has occurred. For the first few days after a stroke, several countries require patients to remain in bed or encourage them to remain in bed for a considerable amount of time. Here, we'll take a look at the subject of Very Early Mobilisation (VEM). Bed rest, VEM, and the limitations of existing literature in the field are all discussed in three sections: Section 1 reviews the effects of bed rest, Very Early Mobilisation (VEM) as a treatment for stroke, and Section 3 outlines the systematic approach taken by our clinical researchers to study VEM after stroke. Very Early Mobilisation (VEM) is a low-tech, low-cost solution that may be implemented in a short period of time. In theory, it might help decrease the enormous personal and community burden of stroke by delivering it to 85 percent of the acute stroke population. In light of the present split in opinion on when mobilisation should begin, conducting a major high-quality clinical trial (such as AVERT) is a viable option. There has been some progress in this area, but further study is needed. The sooner a stroke victim is able to get up and move around, the less likely they are to have long-term disabilities and complications.

Key Words – Disability, Adverse events, Acute stroke, Very early mobilisation (VEM), Standard care (SC), Cerebral venous thrombosis, intracranial hypertension, stroke.

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INTRODUCTION

Stroke-unit care was the subject of an interesting Cochrane systematic study [1] published in 2001. There was evidence that the organisation of service could have a significant impact on the outcome of stroke. A specialised stroke ward, with a multidisciplinary team, team meetings, and patient and staff education, reduced death and long-term disability. Furthermore, the benefits of stroke-unit treatment were not limited to a specific group of patients, but rather extended throughout the full range of stroke severity. [1] Treatments for stroke patients that included rehabilitation showed the most promise. In a subsequent update of the review, which included 6,368 patients from 26 trials, this finding was validated. [2] Clinicians would wonder: How did these research address rehabilitation? Patients would benefit from better care and outcomes if the rehabilitation techniques that were part of the evidence-based therapy could be duplicated. It was not surprising that there were only a few descriptions of the therapists or therapy methods included in the rehabilitation package. Two of the studies that mentioned rehabilitation heavily stressed the importance of early mobilisation in their stroke-unit care. [4,5] An earlier mobilisation in stroke units was associated with significantly better outcomes than in general medical wards where patients were not mobilised early.

Physicians might wonder why it hasn't become normal practise to get stroke patients out of bed and moving around as soon as possible after a stroke because it could have such a big impact on their recovery. There are three key components to this review paper. There is a discussion of the effects of inactivity related with bed rest, as well as recent arguments for and against mandated bed rest following a stroke. With Very Early Mobilisation (VEM) as a therapeutic option for stroke, current physiotherapy procedures in the acute period of care

are briefly reviewed in the second section. The current literature in the subject is briefly discussed here. Our clinical research team has explained their methodical strategy to studying Very Early Mobilisation (VEM) following a stroke in the final part.

ADVERSE EVENTS OF THE STROKE VICTIM

Worldwide, stroke accounts for the second-leading cause of death, as well as the leading cause of long-term disability. [1-3] Almost all stroke patients are hospitalised with additional medical or neurological issues. [4-10] Immobility-related adverse outcomes may account for 51% of deaths in the first month following a stroke. [11] After a stroke, bed rest is thought to affect the heart, lungs, and gastrointestinal, musculoskeletal, and neurological systems, among other organs. Immobility-related adverse effects such as deep vein thrombosis, bed sores, falls, fractures, urinary tract infections, low mood, and a dependence on daily living tasks have all been associated to prolonged bed rest, according to research. Bed rest may potentially worsen these conditions. [12] There has been relatively little research to date to support the use of bed rest in the treatment of a wide range of illnesses, and it has been suggested that bed rest may delay recovery and even cause harm, according to Allen et al's 2010 comprehensive review [13]. Preliminary data from Langhorne and colleagues [8] showed that 311 stroke patients were followed for 30 months to see if they developed any medical or immobility-related problems. Infections and falls are widespread, according to the findings of this study. Pressure ulcers, shoulder ache, and depression have also been found. Acute stroke patients should be moved out of bed and onto a chair as soon as possible to avoid medical and neurological problems. [14,15] "Very Early Mobilization" (VEM) is characterised as an intense out of bed activities of daily living (ADL) within the first 24 hours after symptom onset. One of the most effective and cost-effective interventions is very early mobilisation that requires little or no equipment. Early mobilisation may prevent disability, medical, and immobility-related complications.

BED REST

After a stroke, early mobility makes sense. There have been repeated warnings about the detrimental effects of bed rest for many years. [6,7] Although bed rest may have a deleterious impact on the cardiovascular, pulmonary, renal and digestive systems[8], it is also linked to an increased risk of complications such as deep vein thrombosis, bedsores, osteoporosis, pneumonia and functional deterioration. [8,9] However, there has been a lack of direct research on the impact of bed rest on these mechanisms. Study by Kortebein and colleagues [10] evaluated the effects of 10 days of bed rest on skeletal muscle protein synthesis, nitrogen balance, lean tissue mass and lower limb strength in 12 healthy older men and women (mean age 67). The reduction in all measures after bed rest compared to before bed rest was substantial in this investigation, despite the small size of the sample. As a result of just 10 days of bed rest, lower limb skeletal muscular strength was significantly reduced. This loss was more substantial than that documented in younger individuals after 28 days of bed rest. The antigravity muscles of the calf and back, which are necessary for standing up, appear to atrophy at a higher pace than non-antigravity muscles in the first week of immobilisation. [11-13] Bed rest has a negative impact on bone density, as one might predict. In just four to six weeks of bed rest, Bloomfield[11] found a 6-40 percent decline in bone density. Bed rest can have major effects on the cardiovascular system, with VO2max dropping in healthy persons of any age or gender at an early stage. Within three to four days of starting bed rest, orthostatic intolerance can begin to manifest, and it is more likely to occur in people with cardiovascular disease and the elderly. [15] Even those who are otherwise healthy are influenced by a period of bed rest, according to the findings of the study. Although bed rest's impact on people with illnesses has been studied, the precise physiological reaction of these people to bed rest has gotten less study. There is minimal support for the use of bed rest in the treatment of a wide range of illnesses, according to Allen et al comprehensives review. Bed rest may delay recovery and may even cause harm. [16] They noted that medical practise has been reluctant to modify, even in the face of evidence that bed rest is ineffective. Elderly hospitalised patients (aged 70 and over) who were placed on bed rest upon admission and who remained there, often without valid medical grounds, were found to be more likely to have poor outcomes in a subsequent cohort study by Brown et al. [9]. Physiological and functional implications of bed rest on people with a stroke are not well understood. As far back as 1944, Dock maintained that full bed rest was a highly physiologic and obviously harmful form of therapy, and should only be administered for specified indications and abandoned as soon as possible. [7] After a heart attack, there has been a dramatic shift in understanding about how much rest is beneficial. Treatment has evolved over the past 60 years from a six- to eight-week period of full bed rest to a 12-hour period of rest. Acute myocardial infarction patients should be kept in bed to give time for the heart to recover and for scar formation to be finished, according to the theory. [8] A change in recognised practice was slow, but the revelation that bed rest's harmful effects on various body systems exceeded its benefits to the heart ultimately led to change in practice.

BED REST AFTER STROKE

Bed rest following a stroke is a hot topic in the medical community right now. After a stroke, there is a wide range of opinions on the best time to begin physical exercise. Many doctors, nurses, and physiotherapists in Scotland disagreed on who should be mobilised, when to begin mobilisation, and

who should be responsible for helping the patient with mobilisation. A common practise in Scandinavia is to get out of bed within 24 hours. [4] As a result in some regions of the world, a mandatory period of bed rest ranging from one to three days after a stroke is prescribed. After a stroke occurs, the patient should lie flat for the first 24 hours, then the head of the bed should be raised to 45 degrees on the second day in the absence of intracranial hypertension or worsening neurological state. If symptoms or signals worsen on day three (i.e., after 48 hrs), a patient can have their head elevated to 90° for at least four hours. The patient can sit out of bed in a chair for four hours if they are able to tolerate it (or to stand, if tolerated). Testing this procedure in a randomised trial is acknowledged by the Swiss team. It's worth noting why this protocol was established in the first place. While Diserens et al. acknowledged that the limited research into Very Early Mobilisation (VEM) has produced mixed results and that some studies support the practise, they argue that the Scandinavian practise of VEM is considered by most specialists to be too abrupt, fearing diminished cerebral blood flow by mobilisation out of bed. Essentially, the approach has been guided by clinical opinion due to the scarcity of evidence.

The Wojner-Alexandrov and colleagues stroke regimen also requires 24 hours of bed rest. Based on preliminary studies on the velocity of residual blood flow in ischemic strokes, this was designed. The head of the bed was positioned at 30°, 15°, and 0° in a trial of 20 patients. Flow velocity was measured using transcranial Doppler in each point where the obstruction occurred. Lowering the bed's head from 30 degrees to 15 degrees increased mean flow velocity by 12 percent, according to the researchers. Patients who were placed in a flat (0°) position saw an additional 8% improvement. To estimate cerebral blood flow, there is no direct correlation between transcranial Doppler assessment of mean flow velocity and that measurement. In light of these findings, Wojner-Alexandrov and colleagues believe that a 0° head position may enhance residual flow in the damaged middle cerebral artery and hence improve brain perfusion. Aspiration risk is expected to increase in patients who are placed in a 0° posture for a long period of time, according to the authors.

PHYSIOTHERAPY AND VERY EARLY MOBILISATION (VEM)

Multidisciplinary team-based rehabilitation is widely acknowledged as a vital component in successful stroke care. Shortly after being admitted for stroke, physiotherapy services aim to identify mobility restrictions so that safe bed transfers and procedures for restoring functional mobility can be started as soon as possible. In addition to assessing the patient's risk of falling, a physiotherapist will develop a treatment strategy that includes other health care professionals to help them stay safe. Some sort of mechanism for identifying those who are most at danger of falling, such as large signs above their beds or colorful stickers on their walking aids, is likely to be part of such an approach. Patients with a high risk of falling can also benefit from pressure devices on chairs that sound an alarm if they get up on their own without assistance. For disturbed patients, low beds and chairs (bean bags) or mattresses set out on the floor may be employed. Many hospitals forbid the use of restraints as a fall prevention method. Rehabilitation of upper and lower limb sensorimotor function, as well as therapy of musculoskeletal disorders or consequences (eg, pain in the shoulders), is also addressed by physiotherapists. In the post-acute period, much of the research, and hence the evidence base for physiotherapy's effects, originates. In the first few weeks after a stroke, there is little evidence to support specialised physiotherapy interventions. Because of this, it is usual practise to use established rehabilitative therapies during the acute stroke period. Physiotherapy treatments have the potential to be both helpful and detrimental.

Effective interventions for stroke

- Task-specific training for targeted activities (eg, sitting, standing, walking, reaching, and manipulation of objects), including the use of constraint of the non-affected hand to promote use of the hemiplegic upper limb
- Strength training, including use of electrical stimulation and/or progressive resistance training
- Training for cardiovascular fitness to improve walking capacity
- Intensive training, typically sessions of 20-45 min, twice per day, 3-5 days per week for 4-6 weeks, is superior to less intensive regimes
- Functional electrical stimulation for patients with severe weakness around the shoulder to reduce subluxation and pain, plus use of firm supportive devices for the hemiplegic upper limb.

Use of standard treadmills and body weight-supported treadmills is becoming increasingly common; however, at present there is no evidence to indicate that their use leads to better outcomes than simple walking exercises on the ground.

HARMFUL INTERVENTIONS

- Overhead arm pulleys to exercise the hemiplegic upper limb
- Aggressive passive movements/stretching of the upper limb

Physiotherapy care for stroke patients is heavily influenced by the organisational structure of the facility in which they are being cared for. The number of employees needed varies depending on whether a facility offers acute or rehabilitative treatment. The function of a physiotherapist may be limited in services that focus on acute stroke management to offering early mobility advice, falls risk assessment, avoidance of post-stroke sequelae where physical measures are helpful and, if possible, the start of rehabilitation. In the immediate aftermath of a stroke, protocols have been devised to improve the care of the hemiplegic upper limb. There is still a need for more research to support the benefits of early intervention physiotherapy and other interdisciplinary interventions.

To answer the specific question of whether starting out-of-bed activities (mobilisation) within 48 hours is better than delayed mobilisation in improving outcomes in stroke patients, a Cochrane systematic review is currently underway. This review's findings will not be disclosed ahead of time. The literature in this topic, however, has a few important points to make. Figure 1 shows that there is a lack of high-quality, unconfounded studies in the literature on early rehabilitation interventions that incorporate a mobility component. Few and often with limited sample sizes are trials of physiotherapy therapies after stroke, often comparing two different types of mobility-based interventions. The timing and type of intervention that is administered is often unclear, and few studies have examined the probable negative effects of the intervention. Although some trials show a difference in outcomes when patients begin physiotherapy during the first 24 hours of stroke onset, this was not the primary focus of the studies.

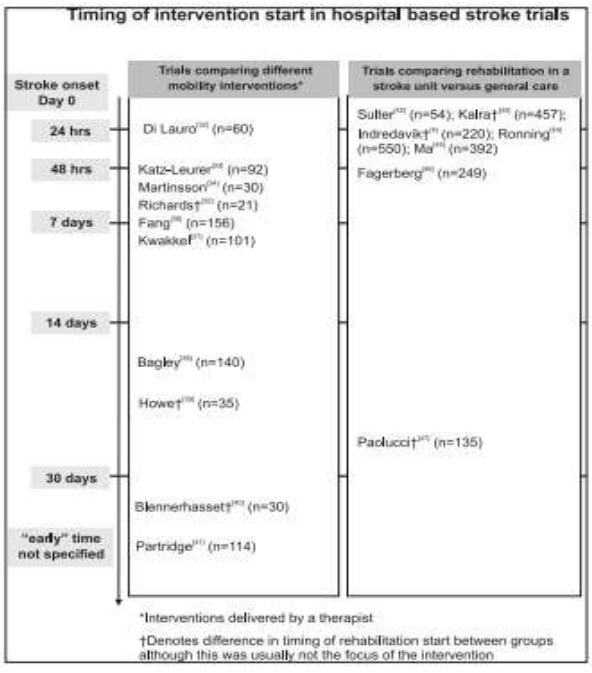

Figure 1: Summary of trials that promote mobility-related interventions and early rehabilitation, showing time post stroke when intervention begins

Figure 1 also depicts trials comparing stroke unit care with standard medical ward care and highlighting the stroke unit's emphasis on early rehabilitation. In many studies, patients treated in these specialised facilities had better results (sometimes significantly better) than those treated on a standard medical ward within 24 hours of the onset of their stroke. Stroke-unit trials often have more stringent design criteria and bigger sample sizes than other types of clinical trials. However, evaluating these studies is complicated by the fact that early rehabilitation is simply one part of care provided in a specialised stroke unit. As a result, it is impossible to evaluate if early rehabilitation (or mobilisation) has any effect on the outcome of the patient. It's also common for the rehabilitation intervention to be vaguely described. A prominent exception is the early mobilisation given in the Trondheim stroke unit in Norway. [4] There was less mortality, a higher rate of discharge and a shorter length of hospital stay for individuals randomised to this stroke unit, compared to patients on the general ward. 64 percent (OR 0.36, 95 percent CI: 0.21-0.61; P = 0.01) of the patients in the stroke unit had their death or dependency probabilities lowered. [1] The researchers discovered that Very Early Mobilisation (VEM) was the best predictor of a better result among the variables that characterised stroke-unit care from that of general medical care. They suggested that patients treated in a stroke unit fare better when mobilisation is started early. Indirect proof of Very Early Mobilisation (VEM) advantages can only be found in well-conducted, randomised research. Only then can the genuine benefit (or harm) of VEM be determined.

IMPACT OF EARLY EXERCISE ON BRAIN INJURY AND REORGANIZATION

No research has been done to assess how early mobilisation and exercise affect brain remodelling or damage. It's critical to take a quick look at this subject now. Furthermore, animal research published as recently as 1997 revealed early exercise following a stroke was associated with severe injury. [61-63] Over the course of seven to fifteen days following a stroke, animals were made to utilise their afflicted leg for a large number of repetitions. Lesion volume was measured after a few days of observation of the animals. In these investigations, animals that started training early had a higher rise in lesion volume than those that started later. As a result of these findings, Aldhous published a warning concerning the dangers of early exercise following a stroke. Clinically, it appears that these publications have made clinicians question the safety of starting activity early after a stroke, as well as to wonder whether it is safe to subject patients for research to the intervention. The rats' body temperatures, on the other hand, were not closely monitored or regulated during these experiments. To say that increased lesion volume was caused only by exercise is impossible because hyperthermia can cause severe damage to ischemic brain tissue on its

own. Early training enhanced functional outcomes despite increasing lesion volume in one study, even though there was an increase in tissue loss. This study's authors themselves deemed the forced exercise "severe" and said that it would not be appropriate for human consumption. Early (within the first 24 hours) and late (within two weeks) exercise were examined in the context of a rat model of ischemic stroke by Yang and colleagues in 2003. Infarct volume was reduced in rats who began training early, compared to those who recovered without intervention. Researchers in this investigation kept tabs on the temperature.

Brain remodeling is thought to be influenced by physical activity. There is still a lot of debate over whether physical exercise should begin following a stroke in animal models. Early vs. late training in people following a stroke has not been extensively studied [Table 1].

Table 1: Key points from review of very early mobilization literature

Summary: Very early mobilization
• Defining the terms 'very early' (< 24 h of symptom onset) and 'mobilization' (out-of-bed activity) is vital
• Current evidence for very early mobilization is indirect, with strongest evidence from a stroke unit in Trondheim, Norway
• Many rehabilitation trials are confounded and therapy trials are often small, with poorly defined interventions
• 86% of patients may be able to mobilize within 24 h of stroke onset, with a transient increase in blood pressure and improved consciousness and O_{2sat}
• Sitting and standing within 48-72 h of stroke onset is associated with improved orthostatic tolerance and O_{2sat} and postural hypotension is uncommon[14,15,17]
• Extreme forced exercise in animal models of stroke appears harmful , but very early modest exercise is better than late exercise
• Activity is a powerful modulator of brain reorganization

FURTHER RESEARCH NEEDED

Very Early Mobilisation (VEM) [Figure 2] still has a lot of unanswered questions. Concerns with VEM have been raised; however the evidence in favour of the technique is weak. However, even if VEM proves to be more beneficial than harmful, there is still a great deal of uncertainty surrounding the best time and dose for the intervention. Very Early Mobilisation (VEM) ability to help or damage a specific patient is likewise unknown. Is it okay to move someone who had an intracerebral haemorrhage, for example? Is it appropriate for patients who have received tPA to begin moving, and if yes, how soon? The role of nurses and physiotherapists in administering the intervention is also up in the air, but most agree that they have a role to play. Finally, the efficiency of the intervention in terms of its price tag must be taken into account. What seemed like a logical step forward in this discipline was to conduct a randomised controlled study using the Very Early Mobilisation (VEM) procedure (RCT).

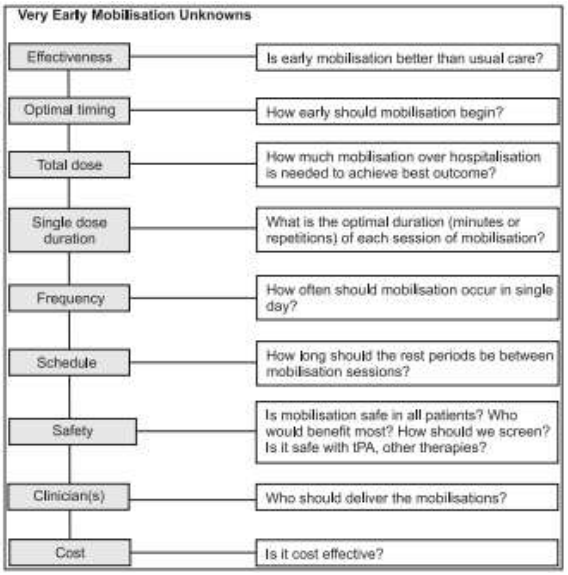

Figure 2: Current unknowns about very early mobilization

CONCLUSION

Very Early Mobilisation (VEM) is a simple, easy-to-deliver intervention, which requires little or no equipment. It is potentially deliverable to 85% of the acute stroke population and, if proven to be effective, may reduce the significant personal and community burden associated with stroke. However, current opinion about when mobilization should start is divided, and one way to move forward is through the conduct of high-quality clinical trials (such as AVERT). Further research in this field is clearly warranted.

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