

Title 8, CALIFORNIA CODE OF REGULATIONS, SECTION 9792.20 ET AL.
APPENDIX E—POSTSURGICAL TREATMENT GUIDELINES
OFFICIAL DISABILITY GUIDELINES' REFERENCES
October 23, 2008 ODG version of Physical Medicine Guidelines

Ankle & Foot

Aldridge T. Diagnosing heel pain in adults. *Am Fam Physician*. 2004 Jul 15;70(2):332-8.

Colorado Division of Workers' Compensation, Medical Treatment Guidelines, Rule XVII, Exhibit C, Lower Extremity Injury, 12/01/01.

Twaddle BC, Poon P. Early motion for Achilles tendon ruptures: is surgery important? A randomized, prospective study. *Am J Sports Med*. 2007 Dec;35(12):2033-8. Epub 2007 Sep 20.

Burns

Simons M, King S, Edgar D; ANZBA. Occupational therapy and physiotherapy for the patient with burns: principles and management guidelines. *J Burn Care Rehabil*. 2003 Sep-Oct;24(5):323-35; discussion 322.

Carpal Tunnel Syndrome

APTA (American Physical Therapy Association). Carpal Tunnel Syndrome. 2006.

Bilic R, Kolundzic R, Trkulja V, Crnkovic T, Vukovic A. The carpal tunnel syndrome: medical and economic advantages of well-timed surgical treatment. *Lijec Vjesn*. 2006 May-Jun;128(5-6):143-9.

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Feuerstein M, Burrell LM, Miller VI, Lincoln A, Huang GD, Berger R. Clinical management of carpal tunnel syndrome: a 12-year review of outcomes. *Am J Ind Med* 1999 Mar;35(3):232-45

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Elbow & Upper Arm

[No postsurgical physical medicine references.]

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Forearm, Wrist, & Hand

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Erdogmus CB, Resch KL, Sabitzer R, Müller H, Nuhr M, Schögl A, Posch M, Osterode W, Ungersböck K, Ebenbichler GR. Physiotherapy-based rehabilitation following disc herniation operation: results of a randomized clinical trial. *Spine.* 2007 Sep 1;32(19):2041-9.

Neck & Upper Back

[No postsurgical physical medicine references.]

Shoulder

[No postsurgical physical medicine references.]

REFERENCE SUMMARIES

Ankle & Foot

Aldridge T. Diagnosing heel pain in adults. *Am Fam Physician*. 2004 Jul 15;70(2):332-8.

Department of Family and Community Medicine, Southern Illinois University School of Medicine, Springfield, Illinois 62794-9671, USA.

Heel pain is a common condition in adults that may cause significant discomfort and disability. A variety of soft tissue, osseous, and systemic disorders can cause heel pain. Narrowing the differential diagnosis begins with a history and physical examination of the lower extremity to pinpoint the anatomic origin of the heel pain. The most common cause of heel pain in adults is plantar fasciitis. Patients with plantar fasciitis report increased heel pain with their first steps in the morning or when they stand up after prolonged sitting. Tenderness at the calcaneal tuberosity usually is apparent on examination and is increased with passive dorsiflexion of the toes. Tendonitis also may cause heel pain. Achilles tendonitis is associated with posterior heel pain. Bursae adjacent to the Achilles tendon insertion may become inflamed and cause pain. Calcaneal stress fractures are more likely to occur in athletes who participate in sports that require running and jumping. Patients with plantar heel pain accompanied by tingling, burning, or numbness may have tarsal tunnel syndrome. Heel pad atrophy may present with diffuse plantar heel pain, especially in patients who are older and obese. Less common causes of heel pain, which should be considered when symptoms are prolonged or unexplained, include osteomyelitis, bony abnormalities (such as calcaneal stress fracture), or tumor. Heel pain rarely is a presenting symptom in patients with systemic illnesses, but the latter may be a factor in persons with bilateral heel pain, pain in other joints, or known inflammatory arthritis conditions.

Publication Types:

- Review
- Review, Tutorial

PMID: 15291091

Rating: 5a

Colorado Division of Workers' Compensation, Medical Treatment Guidelines, Rule XVII, Exhibit C, Lower Extremity Injury, 12/01/01.

Introduction

This document has been prepared by the Colorado Department of Labor and Employment, Division of Workers' Compensation (Division) and should be interpreted within the context of guidelines for

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physicians/providers treating individuals qualifying under Colorado Workers' Compensation Act as injured workers with lower extremity injuries.

Although the primary purpose of this document is advisory and educational, these guidelines are enforceable under the Workers' Compensation rules of Procedure, 7 CCR 1101-3. The Division recognizes that acceptable medical practice may include deviations from these guidelines, as individual cases dictate. Therefore, these guidelines are not relevant as evidence of a provider's legal standard of professional care. To properly utilize this document, the reader should not skip nor overlook any sections.

General Guideline Principles

The principles summarized in this section are key to the intended implementation of all Division of Workers' Compensation guidelines and critical to the reader's application of the guidelines in this document.

Rating: 7a

Twaddle BC, Poon P. Early motion for Achilles tendon ruptures: is surgery important? A randomized, prospective study. *Am J Sports Med.* 2007 Dec;35(12):2033-8. Epub 2007 Sep 20.

Department of Orthopaedics, Auckland City Hospital, Private Bag 92-024, Auckland 1, New Zealand.
brucet@adhb.govt.nz

BACKGROUND: Comparisons of surgically and nonsurgically treated Achilles tendon ruptures have demonstrated that those treated with surgery allow earlier motion and tend to show superior results. However, early motion enhances tendon healing with or without surgery and may be the important factor in optimizing outcomes in patients with Achilles tendon rupture.

HYPOTHESIS: There is no difference in the outcome of acute Achilles tendon rupture treated nonoperatively or operatively if controlled early motion is allowed as part of the rehabilitation program.

STUDY DESIGN: Randomized, controlled clinical trial; Level of evidence, 1.

METHODS: Patients with acute rupture of the Achilles tendon were randomized to surgery or no surgery, with both groups receiving early motion controlled in a removable orthosis, progressing to full weightbearing at 8 weeks from treatment. Both groups were followed prospectively for 12 months with measurements of range of motion, calf circumference, and the Musculoskeletal Functional Assessment Instrument (MFAI) outcome score; any reruptures and any complications were noted.

RESULTS: Both groups were comparable for age and sex. There were no significant differences between the 2 groups in plantar flexion, dorsiflexion, calf circumference, or the MFAI scores measured at 2, 8, 12, 26, or 52 weeks. One patient in each group was noncompliant and required surgical rerepair of the tendon. There were no differences in complications and a similar low number of reruptures in both groups.

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CONCLUSION: This study supports early motion as an acceptable form of rehabilitation in both surgically and nonsurgically treated patients with comparable functional results and a low rerupture rate. There appears to be no difference between the 2 groups, suggesting that controlled early motion is the important part of treatment of ruptured Achilles tendon.

PMID: 17885221

Rating: 2b

Burns

Simons M, King S, Edgar D; ANZBA. Occupational therapy and physiotherapy for the patient with burns: principles and management guidelines. J Burn Care Rehabil. 2003 Sep-Oct;24(5):323-35; discussion 322.

Occupational Therapy Department, Stuart Pegg Paediatric Burns Centre, Royal Children's Hospital, Brisbane, Queensland, Australia.

Clinical practice guidelines are a tool to assist with clinical decision making. They provide information about the care for a condition and make recommendations based on research evidence, which can be adapted locally. A focus group within the Allied Health Interest Group of the Australian and New Zealand Burn Association has compiled the "Occupational Therapy and Physiotherapy for the Patient with Burns--Principles and Management Guidelines." These guidelines are designed as a practical guide to the relevant clinical knowledge and therapy intervention techniques required for effective patient management. Content areas include respiratory management, edema management, splinting and positioning, physical function (mobility, function, exercise), scar management, and psychosocial and mutual elements. The document has undergone extensive review by members of the Australian and New Zealand Burn Association to ensure clarity, internal consistency, and acceptability. The guidelines have been endorsed by the Australian and New Zealand Burn Association. An abridged version of the guidelines is included in this article, with the full document available from www.anzba.org.au.

Publication Types:

- Guideline
- Practice Guideline

PMID: 14501405

Rating: 6b

Carpal Tunnel Syndrome

APTA (American Physical Therapy Association). Carpal Tunnel Syndrome. 2006.

This article explains what carpal tunnel syndrome is and the role physical therapists play in treating this debilitating disease and in educating people about possible risk factors.

Rating: 8c

Bilic R, Kolundzic R, Trkulja V, Crnkovic T, Vukovic A. The carpal tunnel syndrome: medical and economic advantages of well-timed surgical treatment. *Lijec Vjesn.* 2006 May-Jun;128(5-6):143-9.

Klinika za ortopediju Medicinskog fakulteta Sveucilista u Zagrebu i KBC-a Zagreb.

Carpal tunnel syndrome (CTS) is a somewhat neglected medical and economic problem, and surgery is one of the therapeutic options. We analyze the outcomes of surgical treatment in 114 consecutive patients (154 hands). Before the surgery, physical therapy was implemented (96% cases) and the patients were frequently on a sick leave (42% cases). Immediately before the surgery, the patients suffered intensive pain (median 7 on a 0-10 scale), and had a reduced hand function (median 2 on a 0-10 scale). After the surgery (6-12 months), the pain was reduced (difference -5.0, 95% CL -5.5, -4.5, $p < 0.001$), and the function improved (difference 4.5, 95% CLs 4.0, 5.0, $p < 0.001$). Longer time interval between referral to a primary care physician and referral to an orthopedic surgeon (> 1 year in 48% of the cases) was an independent negative predictor for these outcomes. Total difference in costs for sick leaves and physical therapies between the pre- and postoperative periods was estimated at approximately 269.030,00 to over 375.315,00 euros. The time between the entrance into the healthcare system and recognition of the need for surgical treatment of CTS needs to be reduced in order to get better medical and economic results.

PMID: 16910414

Rating: 4c

Cook AC, Szabo RM, Birkholz SW, King EF, Early mobilization following carpal tunnel release. A prospective randomized study, *J Hand Surg [Br]* 1995 Apr;20(2):228-30

Kaiser Permanente, Davis, Sacramento, California, USA.

A prospective randomized study was undertaken of 50 consecutive patients undergoing surgery for idiopathic carpal tunnel syndrome to determine the value of splintage of the wrist following open carpal tunnel release. Patients were randomized to either be splinted for 2 weeks following surgery or to begin range-of-motion exercises on the first post-operative day. Subjects were evaluated at 2 weeks, 1 month, 3

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months, and 6 months after surgery by motor and sensory testing, physical examination, and a questionnaire. Variables assessed included date of return to activities of daily living, dates of return to work at light duty and at full duty, pain level, grip strength, key pinch strength, and occurrence of complications. Patients who were splinted had significant delays in return to activities of daily living, return to work at light and full duty, and in recovery of grip and key pinch strength. Patients with splinted wrists experienced increased pain and scar tenderness in the first month after surgery; otherwise there was no difference between the groups in the incidence of complications. We conclude that splinting the wrist following open release of the flexor retinaculum is largely detrimental, although it may have a role in preventing the rare but significant complications of bowstringing of the tendons or entrapment of the median nerve in scar tissue. We recommend a home physiotherapy programme in which the wrist and fingers are exercised separately to avoid simultaneous finger and wrist flexion, which is the position most prone to cause bowstringing.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

Rating: 2b

Feuerstein M, Burrell LM, Miller VI, Lincoln A, Huang GD, Berger R, Clinical management of carpal tunnel syndrome: a 12-year review of outcomes, *Am J Ind Med* 1999 Mar;35(3):232-45

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Carpal tunnel syndrome (CTS) is a disorder frequently encountered by occupational health care specialists. The health care management of this disorder has involved a diverse set of clinical procedures. The present article is a review of the literature related to CTS with an emphasis on occupational-related CTS. MEDLINE, Cumulative Index to Nursing and Allied Health Literature, PsycLIT, and NIOSHTIC databases from 1985-1997 were searched for treatment outcome studies related to CTS. Treatments of interest included surgery, physical therapy, drug therapy, chiropractic treatment, biobehavioral interventions, and occupational rehabilitation. A systematic review of the effects of these interventions on symptoms, medical status, function, return to work, psychological well-being, and patient satisfaction was completed. Compared to other treatments, the majority of studies assessed the effects of surgical interventions. Endoscopic release was associated with higher levels of physical functioning and fewer days to return to work when compared to open release. Limited evidence indicated: 1) steroid injections and oral use of B6 were associated with pain reduction; 2) in comparison to splinting, range of motion exercises appeared to be associated with less pain and fewer days to return to work; 3) cognitive behavior therapy yielded reductions in pain, anxiety, and depression; and, 4) multidisciplinary occupational rehabilitation was associated with a higher percentage of chronic cases returning to work than usual care. Workers' compensation status was associated with increased time to return to work following surgery.

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Conclusions are preliminary due to the small number of well-controlled studies, variability in duration of symptoms and disability, and the broad range of reported outcome measures. While there are several opinions regarding effective treatment, there is very little scientific support for the range of options currently used in practice. Despite the emerging evidence of the multivariate nature of CTS, the majority of outcome studies have focused on single interventions directed at individual etiological factors or symptoms and functional limitations secondary to CTS.

Publication Types:

- Review
- Review Literature

From Cochrane Library:

Author's objective

To identify scientifically validated treatment and rehabilitation approaches for carpal tunnel syndrome (CTS).

Type of intervention

Treatment.

Specific interventions included in the review

Surgery (open and endoscopic release), pharmacological/vitamins/steroids (taken orally, injected into the carpal canal or transported via iontophoresis), physical therapy (range or motion exercises)/splinting, chiropractic/manipulation, biobehavioural therapies (individual and group cognitive behaviour therapy, muscle activity biofeedback, neuromuscular re-education and movement retraining), and occupational/work rehabilitation

Participants included in the review

People with diagnosed carpal tunnel syndrome, or diagnoses such as 'hand pain', both work-related and non-work-related.

Outcomes assessed in the review

Medical status (two-point discrimination, nerve conduction velocity, Semmes-Weinstein, Phalen's test, Tinel's test, thenar atrophy, interstitial pressure), symptoms (self report) (pain, tenderness, numbness, paresthesia, weakness, night symptoms, fine dexterity loss), function (grip, key pinch, pulp pinch, range of motion, activities of daily living), work status (median days out of work, workers' compensation status, working with pain), psychological well-being (anxiety, depression, coping strategies, sickness), patient satisfaction (treatment satisfaction rating).

Study designs of evaluations included in the review

There were six study designs:

1. Prospective multiple group, in which patients were randomly assigned to treatment conditions and were followed longitudinally.
2. Non-randomised prospective multiple group, in which patients were assigned to different treatment conditions and followed longitudinally, but the assignment was not random.
3. Single group prospective, in which all patients were assigned to a single treatment group and followed longitudinally.
4. Multiple group retrospective, in which patients were assigned to different treatment conditions, and archival data were analysed to assess outcomes.
5. Single group retrospective, in which patients were assigned to one treatment condition and archival data were used.
6. Case study, which presented data on single patient outcomes.

All prospective multiple group studies available were included in the review. Other study designs were included depending on availability of studies with higher levels of study design within the treatment category.

What sources were searched to identify primary studies?

The authors searched the electronic databases of MEDLINE, CINAHL, PsycLIT, and NIOSHTIC for publications between January 1986 and December 1997 using the key words 'outcome', 'surgery', 'therapy', and 'treatment'. The search was limited to English language publications.

Number of studies included

Thirty-four studies met the inclusion criteria: 6 randomised prospective multiple group studies on surgical interventions for CTS with 485 participants (252 in the treatment group, and 233 in the comparison group); 8 non-randomised prospective multiple group studies on surgical interventions for CTS with 1,007 participants (400 in the treatment group, and 396 in the comparison group, with 1 study having three groups of 72, 90, and 49 participants); 6 studies in the pharmacological/vitamins/steroid injections intervention with 290 participants; 6 studies in the physical therapy/splinting for CTS intervention with 332 participants; 1 study in the chiropractic treatment for CTS intervention with 40 participants; 5 studies in the biobehavioural interventions for CTS group with more than 98 participants; and 2 studies in the work/occupational rehabilitation for CTS group with 400 participants.

How were the studies combined?

The studies were combined in a narrative review which gave a description of each individual intervention and then reported the results of each individual study to give a synthesis of the results for that intervention. For those studies that used statistical analysis, only significant findings are reported.

Results of the review

Endoscopic release was associated with higher levels of physical functioning and fewer days to return to work when compared with open release. Both types of surgery were associated with less pain at follow-up compared to pre-surgical levels.

Steroid injections combined with splinting and surgery and oral use of B6 were associated with pain reduction.

In comparison to splinting, range of motion exercises appeared to be associated with less pain and fewer days to return to work.

Cognitive behaviour therapy yielded reductions in pain, anxiety, and depression in one study.

Multidisciplinary occupational rehabilitation was associated with a higher percentage of chronic cases returning to work than usual care.

Was any cost information reported?

In 1989, the average claim amount (medical and indemnity) for new cases of CTS was \$8,070. Recently, (reported in 1998), compensation claims for the federal workforce that involved CTS had an average indemnity cost of \$4,941 per claim.

Author's conclusions

Conclusions are preliminary due to the small number of well- controlled studies, variability in duration of symptoms and disability, and the broad range of reported outcome measures. While there are several opinions regarding effective treatment, there is very little scientific support for the range of options currently used in practice. Despite the emerging evidence of the multivariate nature of CTS, the majority of outcome studies have focused on single interventions directed at individual etiological factors or symptoms and functional limitations secondary to CTS.

CRD commentary

The literature search did cover several databases for relevant material, but it is not clear whether additional studies may have been missed because unpublished and non-English publications were not included.

The authors have not reported on how the articles were selected, or how the quality of the chosen studies was assessed. There is also no report as to who, or how many of the authors, selected the articles and extracted the data. The categorisation of studies for the review was based on the abstracts found in the literature search which may not have provided sufficient data to categorise the studies appropriately. The data from each study is described in a subjective narrative review which gives detail about each study and summarises the outcome for each intervention. There is no discussion about the heterogeneity between the studies which include a wide range of participants and treatments. The results from these studies should be viewed with caution because of the review's limitations.

What are the implications of the review?

The authors state that this review shows the limitations of existing outcomes research in this area which may guide the design of further research.

The authors also state that in practice, given the evidence to date regarding surgery, particularly in workers' compensation cases, conservative care of the patient with CTS should be emphasised as a logical first step. This point is important in those cases where neurological findings are inconsistent or absent.

O'Connor D, Marshall S, Massy-Westropp N. Non-surgical treatment (other than steroid injection) for carpal tunnel syndrome. *Cochrane Database Syst Rev.* 2003;(1):CD003219.

School of Occupational Therapy, University of South Australia, City East Campus, North Terrace, Adelaide, South Australia, Australia. Denise.OConnor@unisa.edu.au

BACKGROUND: Non-surgical treatment for carpal tunnel syndrome is frequently offered to those with mild to moderate symptoms. The effectiveness and duration of benefit from non-surgical treatment for carpal tunnel syndrome remain unknown.

OBJECTIVES: To evaluate the effectiveness of non-surgical treatment (other than steroid injection) for carpal tunnel syndrome versus a placebo or other non-surgical, control interventions in improving clinical outcome.

SEARCH STRATEGY: We searched the Cochrane Neuromuscular Disease Group specialised register (searched March 2002), MEDLINE (searched January 1966 to February 7 2001), EMBASE (searched January 1980 to March 2002), CINAHL (searched January 1983 to December 2001), AMED (searched 1984 to January 2002), Current Contents (January 1993 to March 2002), PEDro and reference lists of articles.

SELECTION CRITERIA: Randomised or quasi-randomised studies in any language of participants with the diagnosis of carpal tunnel syndrome who had not previously undergone surgical release. We considered all non-surgical treatments apart from local steroid injection. The primary outcome measure was improvement in clinical symptoms after at least three months following the end of treatment.

DATA COLLECTION AND ANALYSIS: Three reviewers independently selected the trials to be included. Two reviewers independently extracted data. Studies were rated for their overall quality. Relative risks and weighted mean differences with 95% confidence intervals were calculated for the primary and secondary outcomes in each trial. Results of clinically and statistically homogeneous trials were pooled to provide estimates of the efficacy of non-surgical treatments.

MAIN RESULTS: Twenty-one trials involving 884 people were included. A hand brace significantly improved symptoms after four weeks (weighted mean difference (WMD) -1.07; 95% confidence interval (CI) -1.29 to -0.85) and function (WMD -0.55; 95% CI -0.82 to -0.28). In an analysis of pooled data from two trials (63 participants) ultrasound treatment for two weeks was not significantly beneficial. However

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one trial showed significant symptom improvement after seven weeks of ultrasound (WMD -0.99; 95% CI -1.77 to -0.21) which was maintained at six months (WMD -1.86; 95% CI -2.67 to -1.05). Four trials involving 193 people examined various oral medications (steroids, diuretics, nonsteroidal anti-inflammatory drugs) versus placebo. Compared to placebo, pooled data for two-week oral steroid treatment demonstrated a significant improvement in symptoms (WMD -7.23; 95% CI -10.31 to -4.14). One trial also showed improvement after four weeks (WMD -10.8; 95% CI -15.26 to -6.34). Compared to placebo, diuretics or nonsteroidal anti-inflammatory drugs did not demonstrate significant benefit. In two trials involving 50 people, vitamin B6 did not significantly improve overall symptoms. In one trial involving 51 people yoga significantly reduced pain after eight weeks (WMD -1.40; 95% CI -2.73 to -0.07) compared with wrist splinting. In one trial involving 21 people carpal bone mobilisation significantly improved symptoms after three weeks (WMD -1.43; 95% CI -2.19 to -0.67) compared to no treatment. In one trial involving 50 people with diabetes, steroid and insulin injections significantly improved symptoms over eight weeks compared with steroid and placebo injections. Two trials involving 105 people compared ergonomic keyboards versus control and demonstrated equivocal results for pain and function. Trials of magnet therapy, laser acupuncture, exercise or chiropractic care did not demonstrate symptom benefit when compared to placebo or control. **REVIEWER'S CONCLUSIONS:** Current evidence shows significant short-term benefit from oral steroids, splinting, ultrasound, yoga and carpal bone mobilisation. Other non-surgical treatments do not produce significant benefit. More trials are needed to compare treatments and ascertain the duration of benefit.

Publication Types:

- Review
- Review, Academic

PMID: 12535461

Rating: 1b

Some excerpts:

The incidence of CTS is increasing, and that with age expectancy of seventy years, 3.5 per cent of males and 11 per cent of females will be affected by CTS. Females in their fourth and fifth decades suffer CTS four times more commonly than men. Carpal tunnel syndrome does not follow a predictable course. Some patients experience a deterioration in hand function whilst others describe 'silent' periods and intermittent exacerbation of symptoms. Some patients have described spontaneous improvement of symptoms without medical treatment. The treatment of carpal tunnel syndrome can be categorized into surgical and non-surgical. Surgical treatment is usually offered to those with severe carpal tunnel syndrome, who have constant symptoms, severe sensory disturbance and/ or thenar motor weakness. Non-surgical treatments are offered to those who have the intermittent symptoms of mild to moderate carpal tunnel syndrome. Non-surgical interventions may also be used as a temporary measure while awaiting carpal tunnel release.

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In summary, there is limited evidence that a nocturnal hand brace improves symptoms, hand function and overall patient-reported change in the short-term (up to four weeks of use).

In summary, there is limited evidence that night-only wrist splint use is equally effective as full-time wrist splint use in improving short-term symptoms and hand function.

In summary, there is limited evidence that neutral wrist splinting results in superior short-term overall and nocturnal symptom relief (at two weeks) when compared with wrist splinting in extension. Furthermore, limited evidence suggests that short-term daytime symptom relief is similar for both splint groups.

In summary, there is moderate evidence that two weeks of ultrasound treatment does not improve short-term symptoms beyond that achieved with placebo. However, limited evidence does suggest that ultrasound results in superior symptom relief after seven weeks of treatment and beyond a seven week treatment period (assessed at six months) when compared with placebo. There is limited evidence that seven weeks of ultrasound therapy results in better sensory perception and self-reported improvement when compared to placebo. There is limited evidence that short-term pain and nocturnal waking are similar between ultrasound and placebo-treated groups. Furthermore, there is limited evidence that long-term nerve conduction, grip and pinch strength values are similar for ultrasound and placebo groups. No significant effect of varying intensity of ultrasound delivery was demonstrated for pain, symptoms or nocturnal waking. There is, therefore, limited evidence that continuous ultrasound at 1.5W/cm² is equally effective in improving short-term pain, symptoms and nocturnal waking as continuous ultrasound at 0.8W/cm². In summary, there is limited evidence that ultrasound delivery at 1 MHz is similar to ultrasound delivery at 3 MHz for pain, paraesthesia, sensation, grasp and provocative testing measures in the short-term.

In summary, limited evidence suggests that ergonomic and standard keyboards provide similar improvements in Phalen's and Tinel's sign, timed Phalen's test and peripheral nerve conduction. There is equivocal evidence regarding the effect of ergonomic keyboards on pain relief and hand function.

In summary, limited evidence suggests that diuretic treatment does not improve short-term symptoms in CTS.

No significant effect in favour of NSAID treatment was demonstrated for improving carpal tunnel symptoms. In summary, limited evidence suggests that NSAID treatment does not improve short-term symptoms in CTS.

In summary, there is moderate evidence that oral steroid treatment for two weeks improves short-term symptoms. Limited evidence suggests that symptom improvement is also achieved with four weeks of oral steroid treatment. There is equivocal evidence regarding the short-term symptom benefit beyond the end of an oral steroid treatment period.

In summary, limited evidence suggests that there is no difference in the effect of diuretics and NSAIDs on short-term CTS symptoms.

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In summary, there is limited evidence that short-term oral steroid treatment improves CTS symptoms significantly more than diuretic treatment.

In summary, there is limited evidence to suggest that oral steroid use for 2 to 4 weeks significantly improves short-term symptoms when compared to NSAID treatment.

There is, therefore, limited evidence that vitamin B6 improves finger swelling and movement discomfort with 12 weeks of treatment. Limited evidence suggests that vitamin B6 does not improve symptoms, nocturnal discomfort, hand co-ordination, Phalen's sign and Tinel's sign in the short-term.

In summary, there is limited evidence that nerve and tendon gliding exercises and wrist splinting result in superior static two-point discrimination compared to wrist splinting alone in the medium-term. Limited evidence suggests that exercise plus wrist splinting and wrist splinting alone provide similar improvement in symptoms, hand function, grip strength, pinch strength, Phalen's sign, Tinel's sign and patient satisfaction.

In summary, there is limited evidence that yoga results in superior short-term pain relief and improved outcome for Phalen's sign compared to wrist splinting. There is limited evidence that yoga and wrist splinting provide similar short-term improvement in nocturnal waking, Tinel's sign and grip strength.

In summary, limited evidence suggests that neurodynamic mobilisation does not improve short-term symptoms, pain, hand function, wrist motion, upper limb tension testing nor reduce the likelihood of continuing to carpal tunnel release surgery.

In summary, limited evidence suggests that carpal bone mobilisation improves symptoms in the short-term (with three weeks of treatment). Limited evidence also suggests that carpal bone mobilisation does not improve short-term pain, hand function, wrist motion, upper limb tension test findings or the subsequent need for surgery.

In summary, limited evidence suggests that there is no significant benefit of neurodynamic over carpal bone mobilisation for improving short-term CTS outcomes.

In summary, limited evidence suggests that magnet therapy does not significantly improve short-term pain relief in CTS.

In summary, there is limited evidence that medical care over nine weeks improves physical distress in the short-term when compared with chiropractic treatment. Limited evidence also suggests that chiropractic and medical treatment provide similar short-term improvement in mental distress, vibrometry, hand function and health-related quality of life.

In summary, limited evidence suggests that laser acupuncture does not improve short-term paraesthesiae and night pain in CTS.

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In summary, limited evidence suggests that a steroid injection followed by weekly insulin injections into the carpal tunnel for eight weeks results in superior symptom relief and nerve conduction compared with steroid injection and weekly placebo injections over the same period.

Verhagen AP, Bierma-Zeinstra SM, Feleus A, Karels C, Dahaghin S, Burdorf L, de Vet HC, Koes BW, Ergonomic and physiotherapeutic interventions for treating upper extremity work related disorders in adults, *Cochrane Database Syst Rev.* 2004;(1):CD003471

Department of General Practice, Erasmus MC, P.O. Box 1738, 3000 DR Rotterdam, Netherlands.

BACKGROUND: Conservative interventions such as physiotherapy and ergonomic adjustments play a major part in the treatment of most work-related musculoskeletal disorders (WRMD).

OBJECTIVES: The objective of this systematic review is to determine whether conservative interventions have a significant impact on short and long-term outcomes for upper extremity WRMD in adults.

SEARCH STRATEGY: We searched the Cochrane Musculoskeletal Injuries Group specialised register (January 2002) and Cochrane Rehabilitation and Related Therapies Field specialised register (January 2002), the Cochrane Controlled Trials Register (The Cochrane Library Issue 3, 2001), PubMed (1966 to November 2001), EMBASE (1988 to November 2001), and CINAHL (1982 to November 2001). We also searched the Physiotherapy Index (1988 to November 2001) and reference lists of articles. No language restrictions were applied.

SELECTION CRITERIA: Only randomised controlled trials and concurrent controlled trials studying conservative interventions for adults suffering from upper extremity WRMD were included. Conservative interventions may include exercises, relaxation, physical applications, biofeedback, myofeedback and work place adjustments.

DATA COLLECTION AND ANALYSIS: Two reviewers independently selected the trials from the search yield and assessed the clinical relevance and methodological quality using the Delphi list. In the event of clinical heterogeneity or lack of data we used a rating system to assess levels of evidence.

MAIN RESULTS: We included 15 trials involving 925 people. Twelve trials included people with chronic non-specific neck or shoulder complaints, or non-specific upper extremity disorders. Over 20 interventions were evaluated; seven main subgroups of interventions could be determined: exercises, manual therapy, massage, ergonomics, multidisciplinary treatment, energised splint and individual treatment versus group therapy. Overall, the quality of the studies appeared to be poor. In 10 studies a form of exercise was evaluated, and there is limited evidence about the effectiveness of exercises only when compared to no treatment. Concerning manual therapy (1 study), massage (4 studies), multidisciplinary treatment (1 study) and energised splint (1 study) no conclusions can be drawn. Limited evidence is found concerning the effectiveness of specific keyboards for patients with carpal tunnel syndrome. **REVIEWER'S CONCLUSIONS:** This review shows limited evidence for the effectiveness of

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keyboards with an alternative force-displacement of the keys or an alternative geometry, and limited evidence for the effectiveness of individual exercises. The benefit of expensive ergonomic interventions (such as new chairs, new desks etc) in the workplace is not clearly demonstrated.

Publication Types:

- Meta-Analysis
- Review
- Review, Academic

PMID: 14974016

Rating: 1b

BACKGROUND

The term repetitive strain injury (RSI) is not a diagnosis, but an umbrella term for disorders that develop as a result of repetitive movements, awkward postures, and impact of force (Yassi 1997). Work-related musculoskeletal disorders (WRMD) have been described differently in various countries: RSI in Canada and Europe, both RSI and occupational overuse syndrome (OOS) in Australia and cumulative trauma disorder in the USA (Putz-Anderson 1988). Work-related musculoskeletal disorders can be divided into specific conditions such as carpal tunnel syndrome, which has relatively clear diagnostic criteria and pathology, or non-specific conditions such as tension neck syndrome, which is primarily defined by the location of complaints and whose pathophysiology is less clearly defined. With carpal tunnel syndrome, for instance, between 43 and 90 per cent of cases can be defined as work-related, depending on the setting (industrial or primary care setting) (Hagberg 1992; Miller 1994).

In the USA, cumulative trauma disorders account for between 56 and 65 percent of all occupational injuries (Melhorn 1998; Pilligan 2000). Overall, the estimated prevalence of upper-extremity WRMD is approximately 30 per cent (Yassi 1997; Melhorn 1998). Several studies report a rapidly increasing incidence of WRMD of the upper extremities (Yassi 1997). The costs associated with these disorders are high - over two billion dollars of direct and indirect costs estimated annually in the USA (Pilligan 2000).

Today, much attention is paid to the prevention and treatment of WRMD (Silverstein 1997; Yassi 1997). Conservative interventions such as physiotherapy and ergonomic adjustments play a major part in the prevention or treatment of most WRMD (Pilligan 2000). The direct and indirect costs of these WRMD are a burden to patients, employers and insurance companies. Therefore, there is a need to determine whether conservative interventions have a significant impact on long-term outcomes.

TRIALS COMPARING DIFFERENT TYPES OF INCLUDED CONSERVATIVE TREATMENTS

Thirteen studies compared different conservative treatments.

1. Exercises

In three studies when different forms of exercises were compared the conclusion was defined as 'unclear', meaning not providing data (Ferguson 1976; Kamwendo 1991; Hagberg 2000). Three studies report conflicting results concerning the effectiveness of exercises compared to massage (Rundcrantz 1991; Levoska 1993; Vasseljen 1995). Only the study of Vasseljen 1995 was of high quality but here exercises were a part of both interventions. The study evaluated the difference between individual and group exercises, so no conclusions can be drawn about the effectiveness of the exercises themselves. Therefore we conclude that there is conflicting evidence concerning the effectiveness of exercises compared to massage, and no evidence concerning the effectiveness of exercises when different forms of exercises are compared.

2. Manual therapy/chiropractic treatment

In the study of Bang 2000 significant results were found in pain reduction and isodynamic strength in patients with a shoulder impingement syndrome. Therefore we conclude that there is limited evidence for the efficacy of manual therapy in patients with a shoulder impingement syndrome.

3. Massage

In one study (Ferguson 1976) the conclusion was defined as 'unclear', and one found positive results (significantly) in favour of massage (Leboeuf 1987). In the studies of Levoska 1993 and Vasseljen 1995 massage was a part of a combination of interventions (i.e. a black box), so no conclusions can be drawn concerning the efficacy of massage from these studies. All studies were of low quality, therefore we conclude that there is conflicting evidence of the efficacy of massage in the treatment of upper extremity WRMD.

4. Ergonomics

Two high quality studies (Rempel 1999; Tittiranonda 1999) evaluated the efficacy of six different keyboards on reduction of complaints. Rempel 1999 reported significant positive results of alternative force-displacement of the keys in pain reduction in 12 weeks and Tittiranonda 1999 found no significant differences between different keyboards. The results of the study of Kamwendo 1991 are classified as 'unclear'. Therefore we conclude that there is limited evidence of the efficacy of some keyboards in people with a carpal tunnel syndrome compared with other keyboards.

5. Multidisciplinary treatment

In one low quality non-randomised study a multidisciplinary work re-entry rehabilitation programme is compared with 'usual care' (Feuerstein 1993), reporting non significant positive results. We conclude that there is no evidence of efficacy of a multidisciplinary treatment.

6. Energised splint

There is one study comparing an 'energised splint' with placebo (Stralka 1998). See placebo comparison below.

7. Group therapy versus individual therapy

The study of Vasseljen 1995 is considered of high quality and shows significant short term positive results. Therefore we conclude that when individual exercises are compared with exercises in a group there is limited evidence on short-term efficacy for individual exercises.

TRIALS COMPARING CONSERVATIVE TREATMENTS WITH PLACEBO, OR NO TREATMENT/WAITING LIST CONTROLS

1. Placebo

Two studies compared a conservative treatment with a placebo (Stralka 1998; Tittiranonda 1999). One high quality study (Tittiranonda 1999) evaluated the efficacy of three different keyboards in people with a carpal tunnel syndrome on reduction of complaints and improvement of function with a placebo (= unchanged keyboard). They reported significant positive results of some keyboards compared with the placebo. Therefore we conclude that there is limited evidence for the efficacy of alternative keyboards over a placebo.

One low quality RCT compared an 'energised splint' with placebo (Stralka 1998). The results were classified as 'unclear'.

2. No treatment/waiting list controls

Four studies compared a conservative treatment with a control group receiving no treatment (Kamwendo 1991; Takala 1994; Lundblad 1999; Waling 2000). In all studies forms of exercises were compared with a control group receiving no treatment. In one study the conclusion was defined as 'unclear' (Kamwendo 1991), in two studies (Lundblad 1999; Takala 1994) positive but non-significant results were found and Waling 2000 found significant positive results of exercises on pain, strength and function. All studies were regarded of low quality, therefore we conclude that there is limited evidence concerning the efficacy of exercises compared to a control group receiving no treatment.

DISCUSSION

This review shows that there is limited evidence concerning the effectiveness of specific keyboards for patients with a carpal tunnel syndrome, and limited evidence for the effectiveness of exercises in patients with chronic non-specific neck and shoulder complaints when compared to no treatment. As well as these results, an individual approach appeared to be more effective compared with a group approach.

Elbow & Upper Arm

[No postsurgical physical medicine references.]

Forearm, Wrist, & Hand

Handoll HH, Madhok R, Howe TE, Rehabilitation for distal radial fractures in adults, *Cochrane Database Syst Rev.* 2002;(2):CD003324

c/o University Department of Orthopaedic Surgery, Royal Infirmary of Edinburgh, Little France, Old Dalkeith Road, Edinburgh, UK, EH16 4SU. h.handoll@ed.ac.uk

BACKGROUND: Fracture of the distal radius is a common clinical problem, particularly in older white women with osteoporosis.

OBJECTIVES: To examine the evidence for effectiveness of rehabilitation intervention(s) for adults with conservatively or surgically treated distal radial fractures.

SEARCH STRATEGY: We searched the Cochrane Musculoskeletal Injuries Group specialised register (January 2002), the Cochrane Controlled Trials Register (The Cochrane Library, Issue 4, 2001), the Cochrane Rehabilitation and Related Therapies Field database, MEDLINE (1966 to January 2002), EMBASE (1988 to 2001 Week 50), CINAHL (1982 to December Week 2 2001), Current Controlled Trials (December 2001), AMED, PEDro, conference proceedings and reference lists of articles.

SELECTION CRITERIA: Randomised or quasi-randomised clinical trials evaluating rehabilitation as part of the management of fractures of the distal radius sustained by skeletally mature patients. Rehabilitation interventions such as active and passive mobilisation exercises, and training for activities of daily living, could be used on their own or in combination, and be applied in various ways by various clinicians.

DATA COLLECTION AND ANALYSIS: All trials meeting the selection criteria were independently assessed by all three reviewers for methodological quality. Data were extracted independently by two reviewers. The trials were grouped into categories relating to the main comparisons, and to when the intervention(s) commenced (for example, during or after plaster cast immobilisation). Quantitative data are presented using relative risks or mean differences together with 95 per cent confidence limits.

MAIN RESULTS: Twelve trials, involving 601 mainly female and older patients, were included. Initial treatment was conservative, involving plaster cast immobilisation, in all but 20 patients whose fractures were fixed surgically. Though some trials were well conducted, others were methodologically compromised. No trial provided definitive evidence. Only very limited pooling of results from

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comparable trials was possible. During immobilisation, there was weak evidence of improved hand function in the short term, but not in the longer term, for early occupational therapy (1 trial), and of a lack of differences in outcome between supervised and unsupervised exercises (1 trial). Post-immobilisation, there was weak evidence of a lack of clinically significant differences in outcome in patients receiving formal rehabilitation therapy (3 trials), passive mobilisation (2 trials) or whirlpool immersion (1 trial) compared with no intervention. There was weak evidence of a short-term benefit of continuous passive motion (post external fixation) (1 trial), intermittent pneumatic compression (1 trial) and ultrasound (1 trial). There was weak evidence of better short-term hand function in patients given physiotherapy than in those given instructions for home exercises by a surgeon (1 trial).

REVIEWER'S CONCLUSIONS: The available evidence from randomised trials is insufficient to establish the relative effectiveness of the various interventions used in the rehabilitation of adults with fractures of the distal radius.

Publication Types:

- Review
- Review, Academic

PMID: 12076475

Rating: 1c

Handoll HH, Madhok R, Howe TE. Rehabilitation for distal radial fractures in adults. *Cochrane Database Syst Rev.* 2006 Jul 19;3:CD003324.

Royal Infirmary of Edinburgh, c/o University Department of Orthopaedic Surgery, Old Dalkeith Road, Little France, Edinburgh, UK EH16 4SU. h.handoll@ed.ac.uk

BACKGROUND: Fracture of the distal radius is a common clinical problem, particularly in older white women with osteoporosis.

OBJECTIVES: To examine the effects of rehabilitation interventions in adults with conservatively or surgically treated distal radial fractures.

SEARCH STRATEGY: We searched the Cochrane Bone, Joint and Muscle Trauma Group Specialised Register (December 2005), the Cochrane Central Register of Controlled Trials (The Cochrane Library Issue 4, 2005), MEDLINE, EMBASE, CINAHL, AMED, PEDro, OTseeker and other databases, conference proceedings and reference lists of articles. No language restrictions were applied.

SELECTION CRITERIA: Randomised or quasi-randomised controlled trials evaluating rehabilitation as part of the management of fractures of the distal radius sustained by adults. Rehabilitation interventions

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such as active and passive mobilisation exercises, and training for activities of daily living, could be used on their own or in combination, and be applied in various ways by various clinicians.

DATA COLLECTION AND ANALYSIS: The authors independently selected and reviewed trials. Study authors were contacted for additional information. No data pooling was done.

MAIN RESULTS: Fifteen trials, involving 746 mainly female and older patients, were included. Initial treatment was conservative, involving plaster cast immobilisation, in all but 27 participants whose fractures were fixed surgically. Though some trials were well conducted, others were methodologically compromised. For interventions started during immobilisation, there was weak evidence of improved hand function for hand therapy in the days after plaster cast removal, with some beneficial effects continuing one month later (one trial). There was weak evidence of improved hand function in the short term, but not in the longer term (three months), for early occupational therapy (one trial), and of a lack of differences in outcome between supervised and unsupervised exercises (one trial). For interventions started post-immobilisation, there was weak evidence of a lack of clinically significant differences in outcome in patients receiving formal rehabilitation therapy (four trials), passive mobilisation (two trials), ice or pulsed electromagnetic field (one trial), or whirlpool immersion (one trial) compared with no intervention. There was weak evidence of a short-term benefit of continuous passive motion (post external fixation) (one trial), intermittent pneumatic compression (one trial) and ultrasound (one trial). There was weak evidence of better short-term hand function in participants given physiotherapy than in those given instructions for home exercises by a surgeon (one trial).

AUTHORS' CONCLUSIONS: The available evidence from randomised controlled trials is insufficient to establish the relative effectiveness of the various interventions used in the rehabilitation of adults with fractures of the distal radius.

PMID: 16856004

Rating: 1b

Head

Brown TH, Mount J, Rouland BL, Kautz KA, Barnes RM, Kim J. Body weight-supported treadmill training versus conventional gait training for people with chronic traumatic brain injury. J Head Trauma Rehabil. 2005 Sep-Oct;20(5):402-15.

Department of Physical Therapy, Beechwood Rehabilitation Services, Langhorne, PA 19047, USA.

OBJECTIVES: To compare body weight support treadmill training (BWSTT) to conventional overground gait training (COGT). **DESIGN:** Randomized controlled trial.

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SETTING: Residential rehabilitation center.

PARTICIPANTS: Twenty subjects with chronic traumatic brain injury (TBI).

INTERVENTION: The BWSTT or COGT for 15 minutes plus 30 minutes of exercise 2 days per week, for 3 months.

MAIN OUTCOME MEASURES: Functional Ambulation Category (FAC), Functional Reach (FR), Timed Up and Go; gait velocity, step width (BOS) and step length differential using instrumented gait mat.

RESULTS: Step width approached the norm without between-group differences. Step length differential improved significantly more for the COGT.

CONCLUSIONS: Physical therapy can improve gait for patients more than 6 years post-TBI. The COGT is more effective than the BWSTT for improving gait symmetry during overground walking.
PMID: 16170249

Rating: 2c

Colorado Division of Workers' Compensation. Rule XVII, Exhibit G, Traumatic Brain Injury. Medical Treatment Guidelines. May 1, 2005

For the complete guidelines, click on the link above.

Very complete state workers' comp guidelines. Among the findings are:

ACUTE THERAPEUTIC PROCEDURES – NONOPERATIVE

Resuscitation

The first priority in TBI is complete and rapid physiologic resuscitation. Sedation and neuromuscular blockade are appropriate if needed for transport. Short-acting agents are preferred to allow for serial exams. Hypotension and hypoxia must be avoided to optimize outcome. Avoid unnecessary or prophylactic hyperventilation (Paco₂ less than 26), in the first 24-hours after injury

Intracranial Pressure (ICP) and Cerebral Perfusion Pressure (CPP)

Individuals with brain injury should not be treated for intracranial hypertension (ICH), without clear evidence of brain injury such as a neurologically focal exam, or evidence of herniation syndrome, Glasgow Coma Score (GCS) of less than 9 without systemic explanation (hypotension, hypoxia, significant intoxication), or CT evidence of intracranial pathology with significant mass lesion or swelling.

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- a. ICP Monitoring is indicated in individuals with low GCS (less than 9) and/or CT changes, or when the individual cannot have continual neurologic evaluation (e.g., use of anesthesia), and it should also be considered in situations of posturing or multi-trauma.
- b. Aggressive treatment should be initiated with clinical evidence of ICH, to include transient mild hyperventilation, euvolemia and mannitol (if not hypovolemic), until ICP monitoring may be initiated to measure ICP.
- c. Sedation, neuromuscular blockade, and CSF drainage (if ventriculostomy is in place) are appropriate if needed to control ICH.
- d. Interpretation and treatment of ICP should be corroborated by frequent clinical examination and CPP data. In general, it is desirable to:
 1. Maintain ICP less than 20-25mm Hg
 2. Maintain mean arterial pressure (MAP) above 90
 3. Maintain CPP (MAP at head level minus ICP) at, or above 70mm Hg
- e. Intracranial pressure monitoring devices have therapeutic potential but consideration should be given to possible risks related to accuracy and reliability.
- f. Cerebral oxygen saturation monitoring is an emerging technology that may be used, usually in conjunction with ICP monitoring, to assess the effects of treatment interventions on oxygen delivery to the injured brain, and to optimize the management of brain swelling and intracranial pressure in the setting of severe brain injury.
- g. Hyperventilation: Controlled hyperventilation may be necessary for brief periods in acute neurologic deterioration not attributable to systemic pathology (i.e., hypotension). Avoid prophylactic hyperventilation (if $Paco_2$ is less than 30 mm) in the absence of ICP monitoring or with normal ICP and within the first 24 hours after severe brain injury to reduce the risk of secondary ischemia
- h. Options for use of mannitol in treating ICP elevations:
 1. Use prior to ICP monitoring only if neurologic deterioration is not attributable to systemic pathology (i.e., hypotension) and/or if there are signs of transtentorial herniation
 2. Euvolemia must be established and maintained
 3. Keep serum osmolarity (OSM) less than 320, especially in acute renal failure (ARF)
 4. Bolus (rather than drip) mannitol is more effective treatment for elevated ICP
- i. Glucocorticoids (steroids) are not useful or generally accepted to improve outcome or decrease ICP, and in some instances may be harmful. There is good evidence that they do not decrease mortality, and there is some evidence that they may even increase the mortality rate in trauma individuals with brain injuries.
- j. Barbiturates may be used to treat elevated ICP as a last resort.

Nutrition

Nutritional support should be aggressively initiated as soon as practicable. Preferable route is jejunal by gastrojejunostomy. Early aggressive establishment of positive nitrogen balance is probably beneficial. Appropriate caloric input should be established by the seventh day. Nutritionist or dietitian consultation may be indicated.

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Anticonvulsants

Anticonvulsant treatment may be used to prevent early posttraumatic seizures in the high-risk individual, and are usually administered for one week in those with intracranial hemorrhage. Prevention of early seizures has no statistically significant impact on long-term outcome or the development of late seizures or chronic epilepsy. Prevention of early seizures is reasonable to reduce seizure-associated complications during acute management.

Hypothermia is an evolving technology for controlling ICP. It has possible utility in hypoxic or ischemic encephalopathy, however, its use in TBI is currently investigational. It may benefit individuals with a critically elevated ICP unresponsive to traditional therapies.

Of course, hyperthermia must be treated aggressively to avoid exacerbation of increased ICP.

Imaging Procedures

Skull X-Rays: are well-established diagnostic tools used to detect a fracture of the skull base or cranial vault. CT scanning is preferred if fractures are suspected because the CT scan may identify clinically significant fracture as well as potentially co-existent contusion or hemorrhage. Skull x-rays are generally accepted if CT scans are not available.

Computed Axial Tomography (CT): is a well-established brain imaging x-ray study comprising of a mathematical reconstruction of the tissue densities of the brain, skull, and surrounding tissues. CT scans require the use of computer-based scanning equipment. For acute brain trauma, iodine contrast enhancement is not necessary. CT scans are noninvasive and should reveal the presence of blood, skull fracture, and/or structural changes in the brain. CT scans provide limited information about intrinsic cerebral damage involving deep brain structures.

CT scans are widely accepted for acute diagnostic purposes, and for planning acute treatment. They are the screening image of choice in acute brain injury and are used to assess the need for neurosurgical intervention. CT scans are recommended for abnormal mental status, focal neurologic deficits, or acute seizure and should also be considered in the following situations:

- Signs of basilar skull fracture
- Physical evidence of trauma above the clavicles
- Acute traumatic seizure
- Age greater than 60
- An interval of disturbed consciousness
- Pre-or post-event amnesia
- Drug or alcohol intoxication
- Any recent history of TBI, including MTBI

Magnetic Resonance Imaging (MRI): is a well-established brain imaging study in which the individual is positioned in a magnetic field and a radio-frequency pulse is applied. Hydrogen proton energy emission is translated into visualized structures. Normal tissues give off one signal, while abnormal

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structures give off a different signal. Due to its high contrast resolution, MRI scans are superior to CT scans for the detection of some intracranial pathology, except for bone injuries such as fractures. MRI may reveal an increased amount of pathology as compared with CT. Specific MRI sequences and techniques are very sensitive for detecting traumatic cerebral injury; they may include, but are not limited to, diffusion-tensor, gradient echo, and Fluid Attenuated Inversion Recovery (FLAIR). Some of these techniques are not available on an emergency basis. MRI scans are useful to assess transient or permanent changes, to determine the etiology of subsequent clinical problems, and to plan treatment. MRI is more sensitive than CT for detecting traumatic cerebral injury. Initially, MRI scans are clinically useful in the following situations to:

- Determine neurological deficits not explained by CT
- Evaluate prolonged interval of disturbed consciousness
- Define evidence of acute changes super-imposed on previous trauma or disease

VASCULAR IMAGING TESTS reveal arterial or venous abnormalities in the chest, neck, head, or extremities (e.g., thrombosis, dissection, spasm, emboli, or tearing). These studies are generally used if more standard CT/MRI fails to demonstrate suspected vascular abnormalities. They may be useful in moderate/severe TBI as an adjunct to aforementioned studies, but only rarely in MTBI. Procedures that are generally accepted include:

- a. Arteriography:** is generally accepted, when the above-noted traumatic vascular abnormalities are suspected but unproven with the techniques discussed so far, or when further investigation of the vascular lesion is necessary. This is particularly true with arteriovenous fistulous change.
- b. Venography:** is generally accepted, if increased venous flow and pressure are suspected and still undemonstrated. This is done either by the jugular or orbital systems.
- c. Noninvasive Vascular Assessment (NIVA):** is the least invasive and may demonstrate direction of blood flow and general patency of the carotid and vertebral arterial systems in the neck, but not in the head.
- d. Magnetic Resonance Angiography(Magnetic Resonance Arteriography(MRA) /Magnetic Resonance Venography(MVA)):** is indicated when vessel changes are suspected but not demonstrated by other simpler tests. Internal obstruction of an artery (e.g., thrombosis, spasm, dissection, emboli from a concomitant chest, or neck injury) may be demonstrated. Arterial compression due to an external pressure (e.g., bony fracture or mass affect from a large intra-axial hemorrhage or cerebral edema) may be demonstrated. Dissection or arteriovenous fistula formation may be seen, but as with other vascular abnormalities may need conventional contrast arteriography/venography to confirm or refute the MRA or MRV findings. The source for intra or extra-axial bleeding may be seen. Intracerebral dural venous sinus thrombosis, as well as poor venous return may be demonstrated by MRA or MRV.

LUMBAR PUNCTURE is a well-established diagnostic procedure for examination cerebrospinal fluid (CSF) in neurological disease and injury. The procedure should be performed by qualified and trained

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physicians under sterile conditions. Lumbar puncture is contraindicated in acute trauma to the spinal column, certain infections, increased intracranial pressure due to space occupying lesions, and in some coagulation disorders or defects. Additionally, it should be avoided if there are cutaneous infections in the region of the puncture site.

In individuals with suspected or known increased intra-cranial pressure, lumbar puncture should be preceded by fundoscopic examination and by a CT scan or MRI. If no radiographic evidence of extra-axial hemorrhage, mass effect, or impending brain herniation is found then lumbar puncture may proceed. If CT or MRI shows intracerebral, intra-ventricular, or subarachnoid blood, lumbar puncture should be withheld until neurological consultation is obtained.

For the complete guidelines including information on therapeutic and operative procedures, click [here](#).

Publication Type:

- Nationally Recognized Treatment Guideline

Rating: 7a

Driver S, O'connor J, Lox C, Rees K. Evaluation of an aquatics programme on fitness parameters of individuals with a brain injury. Brain Inj. 2004 Sep;18(9):847-59.

University of Virginia, VA, USA. sjd4x@virginia.edu

The primary objective was to determine the effect of an aquatic exercise programme on the physical fitness of people with a brain injury. A pre-test-post-test randomized-groups design was conducted. Sixteen outpatients with a brain injury were included in the study. Eight participants were assigned to an aquatic exercise group and eight to a control group. The components of physical fitness measured included cardiovascular endurance, body composition, muscular strength and endurance and flexibility. Measurements were taken pre- and post-programme. Results indicated an increase in components of physical fitness for the experimental group but not the control group. Increases in fitness were reported as having a positive impact on the functional capacity of individuals in the exercise group as well as enhancing the individual's ability to complete activities of daily living successfully. Results indicate that aquatic exercise may positively impact the primary and secondary physical injuries caused by a brain injury. Copyright 2004 Taylor and Francis Ltd

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 15223738

Rating: 2

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Franckeviciute E, Krisciunas A. Peculiarities of physical therapy for patients after traumatic brain injury. Medicina (Kaunas). 2005;41(1):1-6.

Department of Rehabilitation, Kaunas University of Medicine Hospital, Eiveniu 2, 50009 Kaunas, Lithuania. egle_77@yahoo.com

Literature review data about methods and means of physical therapy for patients after traumatic brain injury is presented in this article. Traumatic brain injury is an urgent medical and social problem all over the world. It is the most common cause of disability in Lithuania. Patient rehabilitation after traumatic brain injury is divided into two periods: acute and subacute. In the beginning of rehabilitation physical therapist evaluates patient's functional status, later he uses methods and means of treatment, and evaluates effectiveness of rehabilitation. Early verticalisation is very important for patients with coma. Physical therapy consists of prevention of complications, improvement of muscle force, and range of motions, balance, movement coordination, endurance and cognitive functions. Early rehabilitation is necessary for traumatic brain injury patients and use of physical therapy methods can help to regain lost functions and to come back to the society.

Publication Type:

- Review

PMID: 15687744

Rating: 5c

Shiel A, Burn JP, Henry D, Clark J, Wilson BA, Burnett ME, McLellan DL. The effects of increased rehabilitation therapy after brain injury: results of a prospective controlled trial. Clin Rehabil. 2001 Oct;15(5):501-14.

University of Southampton Rehabilitation Research Unit, UK. agnes.shiel@mrc-cbu.cam.ac.uk

OBJECTIVE: The objective was to investigate the effect of increased intensity of rehabilitation therapy provided to brain-injured subjects on the rate at which independence was regained and the duration of hospital admission.

DESIGN: A two-centre, prospective, controlled study with random allocation to groups.

SETTING: Two district general hospitals on the south coast of England.

SUBJECTS: Fifty-six people with moderate and severe head injury consecutively admitted to Southampton and Poole hospitals between June 1995 and September 1997.

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INTERVENTIONS: Increased intensity of rehabilitation therapy input without change in content.

RESULTS: Subjects receiving more intensive therapy made more rapid progress and were discharged home sooner. The different intensities of therapy employed in this study showed no evidence of a 'ceiling' effect and the 'intervention group' made significantly more rapid progress on tests of dependency during the period of admission. A clear response to increased therapy input was seen in one of the centres with more rapid functional improvement and a shorter length of hospital stay. This centre already had more therapy and better community facilities. No such benefits were seen at the other centre where the intervention group had a longer hospital stay than the routine group.

CONCLUSION: Increasing the hours per week of therapy given to adults recovering from brain injury in hospital can accelerate the rate of recovery of personal independence and result in their being discharged from hospital sooner. Increased rehabilitation therapy after brain injury is associated with enhanced functional recovery and shorter hospital stay if provided in the context of an integrated service that can provide ongoing community support. There is no evidence of any ceiling effect of therapeutic intensity beyond which no further response is observed.

Publication Types:

- Clinical Trial
- Multicenter Study
- Randomized Controlled Trial

PMID: 11594640

Rating: 2c

Hernia

[No postsurgical physical medicine references.]

Hip, Pelvis and Thigh

Binder EF, Brown M, Sinacore DR, Steger-May K, Yarasheski KE, Schechtman KB. Effects of extended outpatient rehabilitation after hip fracture: a randomized controlled trial. *JAMA*. 2004 Aug 18;292(7):837-46.

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This RCT included 90 patients, and concluded that in elderly patients with hip fracture, six months of outpatient rehabilitation including progressive resistance training improves physical function and quality of life and reduces disability compared with low-intensity home exercise.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 15315998

Rating: 2c

Bolgl LA, Uhl TL. Electromyographic analysis of hip rehabilitation exercises in a group of healthy subjects. J Orthop Sports Phys Ther. 2005 Aug;35(8):487-94.

Rehabilitation Sciences, University of Kentucky, Lexington, KY, USA. labolg2@uky.edu

STUDY DESIGN: Single-occasion, repeated-measures design.

OBJECTIVE: To determine the magnitude of hip abductor muscle activation during 6 rehabilitation exercises.

BACKGROUND: Many researchers have reported that hip strengthening, especially of the hip abductors, is an important component of a lower extremity rehabilitation program. Clinicians employ non-weight-bearing and weight-bearing exercise to strengthen the hip musculature; however, researchers have not examined relative differences in muscle activation during commonly used exercises. Information regarding these differences may provide clinicians with a scientific rationale needed for exercise prescription.

METHODS AND MEASURES: Sixteen healthy subjects (mean +/- SD age, 27 +/- 5 years; range, 18-42 years; mean +/- SD height, 1.7 +/- 0.2 m; mean +/- SD body mass, 76 +/- 15 kg) volunteered for this study. Bipolar surface electrodes were applied to the right gluteus medius muscle. We measured muscle activation as subjects performed 3 non-weight-bearing (sidelying right hip abduction and standing right hip abduction with the hip at 0 degrees and 20 degrees of flexion) and 3 weight-bearing (left-sided pelvic drop and weight-bearing left hip abduction with the hips at 0 degrees and 20 degrees of flexion) exercises. Data were expressed as a percent of maximum voluntary isometric contraction of the right gluteus medius. Differences in muscle activation across exercises were determined using a 1-way analysis of variance with repeated measures, followed by a sequentially rejective Bonferroni post hoc analysis to identify differences between exercises.

RESULTS: The weight-bearing exercises demonstrated significantly greater EMG amplitudes ($P < .001$) than all non-weight-bearing exercises except non-weight-bearing sidelying hip abduction.

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CONCLUSION: The weight-bearing exercises and non-weight-bearing sidelying hip abduction exercise resulted in greater muscle activation because of the greater external torque applied to the hip abductor musculature. Although the non-weight-bearing standing hip abduction exercises required the least activation, they may benefit patients who cannot safely perform the weight-bearing or sidelying hip abduction exercises. Clinicians may use results from this study when designing hip rehabilitation programs.

Publication Types:

- Clinical Trial

PMID: 16187509

Rating: 2c

Brigham and Women's Hospital. Lower extremity musculoskeletal disorders. A guide to diagnosis and treatment. Boston (MA): Brigham and Women's Hospital; 2003.

Osteoarthritis

Pain in the groin area, usually worsens with weight bearing and improves with rest. Lateral, flank, or buttock pain usually not "true" hip pain and suggests a different problem.

- May present as referred pain in the knee
- Painful, limping gait
- Progressive loss of range of motion
- Crossing one's legs, tying shoes, and walking are painful.

Diagnostic Testing

Differential diagnosis includes back pathology and trochanteric bursitis. Radiographic testing usually shows joint space narrowing in the superior lateral area of the hip. Spine films indicated when diagnosis is uncertain.

Physical Exam

Decreased range of motion of the hip in flexion, adduction, and internal rotation.

Treatment

- Acetaminophen, up to 4,000 mg a day initial drug of choice
- NSAIDs are more effective, but they are a second-line therapy because of toxicity. Cyclooxygenase (COX)-2 inhibitors are associated with fewer gastrointestinal (GI) side effects than NSAIDs but they carry a risk of renal toxicity and are quite costly.

Rehabilitation (Physical or Occupational Therapy)

- Pain management techniques (positioning, posture cues, use of heat/cold for symptom management)
- Exercise program to maintain or improve joint range of motion and muscle strength
- Appropriate assistive device (e.g., cane) to improve ambulation

Referral

Refer to surgery when patient feels the benefits of surgery outweigh the risks. For some this will be early in the process, to maintain active function, while for others this will be when pain is too severe to carry out activities of daily living.

Surgical Intervention

Total hip replacement (THR) should be undertaken when the above measures have failed. Total hip replacement is underutilized in women, yet it is a very effective treatment for osteoarthritis of the hip with a less than 1% mortality. Results are best in centers that perform high numbers of the procedure.

Trochanteric Bursitis

- May or may not have history of trauma/fall onto affected hip
- Pain is generally felt in the area of the posterior, lateral greater trochanter.
- Pain may also extend down the lateral thigh or occasionally into the buttocks.
- Patients complain that activities such as rising to a standing position, sleeping on affected side, and/or going up or down stairs cause increase in pain.

Diagnostic Testing

Clinical diagnosis

Physical Exam

Tenderness over the posterior lateral greater trochanter, especially when palpated with patient lying on unaffected side and downward pressure exerted over affected soft tissue

Treatment

NSAIDs are helpful for management of pain. Stretching program very helpful.

Rehabilitation (Physical or Occupational Therapy)

- Modalities for pain management (iontophoresis, heat/cold)
- Patient education for activity modification, specific stretching techniques, and home exercises program
- Exercise program to restore joint range of motion, correct muscle imbalance, promote joint proprioception
- Gait training

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Referral

Referral to subspecialist for corticosteroid injection may be helpful.

Surgical Intervention

Not indicated

Iliotibial Band Syndrome

Aching or burning pain over the lateral femoral condyle or proximal lateral tibia, and may radiate up the thigh toward the hip

Diagnostic Testing

Clinical diagnosis

Physical Exam

Pain on palpation of the iliotibial band (localized or along the entire band)

Treatment

- NSAIDs to reduce pain and inflammation
- Wearing proper shoes and advising patients to run on even terrain or softer surfaces
- Orthotics may help to improve alignment.

Rehabilitation (Physical or Occupational Therapy)

- Stretching exercises to restore flexibility
- Patient education on activity modifications and proper shoe wear
- Exercises to restore muscle strength and correct imbalances
- Orthotics may be needed.

Referral

Referral to subspecialist for local corticosteroid injections into areas of tenderness may be helpful.

Surgical Intervention

Not indicated

Rating: 6b

Cameron ID. Coordinated multidisciplinary rehabilitation after hip fracture. Disabil Rehabil. 2005 Sep 30-Oct 15;27(18-19):1081-90.

Rehabilitation Studies Unit, Faculty of Medicine, University of Sydney, Australia.
ianc@mail.usyd.edu.au

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PURPOSE: To review the topic of coordinated multidisciplinary rehabilitation after hip fracture from a research perspective and to provide information to guide the provision of rehabilitation services for patients with hip fracture.

METHODS: Literature review including searches of Medline, Embase, Cochrane Collaboration and evidence based clinical guidelines, checking of references of publications and consultation with researchers.

RESULTS: The research evidence is heterogeneous and remains inclusive. Programs that assist patients with hip fracture to regain function and return home as soon as feasible are likely to be effective as they appear to increase the percentage of patients who return home and remain there after hip fracture. Rehabilitation programs that achieve this are likely to be cost effective. These programs involve health professionals from multiple disciplines (nurses, allied health professionals and medical practitioners) who work collaboratively, may operate in several settings, and routinely provide specific treatments that are supported by strong evidence of effectiveness.

CONCLUSIONS: Patients with hip fracture should be offered a coordinated a multidisciplinary rehabilitation program with the specific aim of regaining sufficient function to return to their pre-fracture living arrangements.

PMID: 16315427

Rating: 5b

Expert Clinical Benchmarks. Lower extremity (hip, knee and ankle). King of Prussia (PA): MedRisk, Inc.; 2004.

MAJOR RECOMMENDATIONS

General

During the initial evaluation, the therapist should include questions about work task requirements in the patient history interview and incorporate these findings in the treatment objectives.

The therapist's treatment regimen should be directed toward improving the patient's functional ability rather than based on the patient's impairment.

The therapist's treatment regimen should emphasize active interventions over passive modalities and should become less frequent toward the end of the episode of care in order to encourage patient behavioral gains.

Non-Surgical

For non-surgical lower extremity (hip, knee, and ankle) conditions, a series of physical therapy treatments should be delivered ranging from 10 to 24 visits over a period of 6 to 12 weeks, depending upon severity (see table below). Refer to the original guideline document for recommendations on the time, choice, and

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sequence of interventions, as well as interventions that are generally recommended, interventions recommended on a case specific/clinical judgement basis, and interventions that are not recommended. Specific interventions are listed in the "Interventions and Practices Considered" field in the Complete Summary.

Surgical

For surgical lower extremity (hip, knee, and ankle) conditions, a series of physical therapy treatments should be delivered ranging from 16 to 28 visits over a period of 6 to 15 weeks, depending upon severity (see table below). Refer to the original guideline document for recommendations on the time, choice, and sequence of interventions as well as interventions that are generally recommended, interventions recommended on a case specific/clinical judgement basis, and interventions that are not recommended. Specific interventions are listed in the "Interventions and Practices Considered" field in the Complete Summary.

Publication Type:

- Nationally Recognized Treatment Guideline

Rating: 6b

Handoll HH, Sherrington C, Parker MJ. Mobilisation strategies after hip fracture surgery in adults. Cochrane Database Syst Rev. 2004 Oct 18;(4):CD001704.

University Department of Orthopaedic Surgery, Royal Infirmary of Edinburgh, Little France, Old Dalkeith Road, Edinburgh, UK, EH16 4SU.

BACKGROUND: Hip fracture, which happens in predominantly elderly populations, often results in a reduction in mobility. Care programmes after hip fracture surgery include strategies for mobilisation, such as early weight bearing and gait retraining. Other mobilisation strategies, such as exercises and physical training, are used at various stages in rehabilitation including after discharge from hospital.

OBJECTIVES: To evaluate the effects of different mobilisation strategies and programmes after hip fracture surgery.

SEARCH STRATEGY: We searched the Cochrane Musculoskeletal Injuries Group Specialised Register (May 2004), the Cochrane Central Register of Controlled Trials (The Cochrane Library Issue 2, 2004), MEDLINE and other databases, conference proceedings and reference lists of articles.

SELECTION CRITERIA: All randomised or quasi-randomised trials comparing different mobilisation strategies/programmes after hip fracture surgery.

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DATA COLLECTION AND ANALYSIS: The reviewers independently assessed trial quality and extracted data.

MAIN RESULTS: Our third update, which extended the review scope to cover the whole rehabilitation period, included four new trials. Most of the 10 included trials were small and all had methodological limitations, including inadequate follow up. Seven trials evaluated mobilisation strategies started soon after hip fracture surgery. One trial (273 participants) found no statistically significant differences in unfavourable outcomes for weight bearing started at two versus 12 weeks after internal fixation of a displaced intracapsular fracture. Of two trials (188 participants) comparing a more with a less intensive regimen of physiotherapy, one reported a lack of demonstrable difference in recovery of the two patient groups, and the other found a higher level of drop-out in the more intensive group with no difference in length of hospital stay. One trial (80 participants) comparing two-week programmes of weight-bearing versus non-weight-bearing exercise found some short-term improvement in mobility and balance in the weight-bearing exercise group. One trial (80 participants) found improved mobility, leg extension power and Barthel score in those given a quadriceps muscle strengthening exercise programme. One trial (40 participants) found no statistically significant difference in recovery of mobility and time to hospital discharge after a treadmill versus conventional gait retraining programme. One trial (27 participants) comparing neuromuscular stimulation of the quadriceps muscle with placebo found a greater recovery of pre-fracture mobility in the stimulation group. The interventions tested by the three remaining trials started after hospital discharge. One trial (28 participants) found improved outcome after 12 weeks of intensive physical training. One trial (120 participants) found improved outcome after home-based exercises started around 22 weeks from injury. One trial (44 participants) found home-based weight-bearing exercises starting at seven months produced no statistically significant differences aside, perhaps, for greater quadriceps strength.

REVIEWERS' CONCLUSIONS: There is insufficient evidence from randomised trials to determine the effectiveness of the various mobilisation strategies examined in this review that start either in the early post-operative period or during the later rehabilitation period. Further research is required to establish the possible benefits of the additional provision of interventions primarily aimed at enhancing mobility.

Publication Types:

- Meta-Analysis
- Review
-

PMID: 15495015

Rating: 1c

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Jain R, Basinski A, Kreder HJ. Nonoperative treatment of hip fractures. *Int Orthop.* 2003;27(1):11-7. Epub 2002 Nov 12.

San Diego Sports Medicine and Orthopaedic Center, 6719 Alvarado Road, Suite 200, 92120 San Diego, CA, USA. rina.jain@sympatico.ca

We retrospectively reviewed a population database and a case series to compare the mortality of operative and nonoperative treatment of hip fractures in patients with severe comorbidity. Nonoperative treatment of hip fractures (bed rest or early weight bearing) was administered based on medical assessment of perioperative risk. Comparison of 30-day mortality was performed between the nonoperatively and operatively treated groups. We found that of 50,235 of hip fractures that occurred between 1992 and 1998, 89.4% were treated operatively. Thirty-day mortality rate in the nonoperatively treated patients (18.8%) was higher than the rate in operatively treated patients (11.0%) (odds ratio 1.7 times, 95% confidence interval (CI) 1.6, 1.8). In the case series, of 62 elderly patients with severe comorbidity treated nonoperatively, 41 had bed rest/traction, while 21 were mobilized early. A group of operatively treated patients (n=108) was compared to nonoperatively treated patients. Mortality with nonoperative treatment was higher with bed rest (73%) compared to early mobilization (odds ratio 3.8, 95% CI 1.1-14.0). There was no significant difference in mortality between operatively treated patients (29%) and patients treated nonoperatively with immediate mobilization (19%). Bed rest was 2.5 times more likely to be associated with mortality compared to operative treatment (95% CI 1.1-5.5).

Publication Type:

- Meta-analysis

PMID: 12582802

Rating: 1a

Jan MH, Hung JY, Lin JC, Wang SF, Liu TK, Tang PF. Effects of a home program on strength, walking speed, and function after total hip replacement. *Arch Phys Med Rehabil.* 2004 Dec;85(12):1943-51.

School and Graduate Institute of Physical Therapy, College of Medicine, National Taiwan University, Taipei, Republic of China.

OBJECTIVE: To assess the efficacy of a home exercise program in increasing hip muscle strength, walking speed, and function in patients more than 1.5 years after total hip replacement (THR).

DESIGN: Randomized controlled trial.

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SETTING: Kinesiology laboratory.

PARTICIPANTS: Fifty-three patients with unilateral THR were randomly assigned to the training (n=26) and control (n=27) groups. Patients in the training group were further divided into exercise-high (n=13) and exercise-low (n=13) compliance groups according to their practice ratio (high, > or =50%).

INTERVENTION: The training group underwent a 12-week home program that included hip flexion range of motion exercises for both hip joints; strengthening exercises for bilateral hip flexors, extensors, and abductors; and a 30-minute walk every day. The control group did not receive any training.

MAIN OUTCOME MEASURES: Strength of bilateral hip muscles, free and fast walking speeds while walking over 3 different terrains, and functional performance were assessed by using a dynamometer, videotape analysis, and the functional activity part of the Harris Hip Score, respectively, before and after the 12-week period.

RESULTS: Subjects in the exercise-high compliance group showed significantly ($P < .05$) greater improvement in muscle strength for the operated hip, fast walking speed, and functional score than those in the exercise-low compliance and control groups.

CONCLUSIONS: The designed home program was effective in improving hip muscle strength, walking speed, and function in patients after THR who practiced the program at least 3 times a week, but adherence to this home program may be a problem.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 15605331

Rating: 2c

Kuisma R. A randomized, controlled comparison of home versus institutional rehabilitation of patients with hip fracture. Clin Rehabil. 2002 Aug;16(5):553-61.

Department of Rehabilitation Sciences, Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong. rskuisma@polyu.edu.hk

OBJECTIVE: To compare ambulation outcomes between home and institutional rehabilitation of patients with hip fracture.

DESIGN: Randomized controlled clinical equivalence trial.

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SETTING: The Queen Elizabeth Hospital in Hong Kong.

SUBJECTS: Eighty-one patients with hip fracture.

INTERVENTION: Study group patients (40) were discharged directly home from the acute hospital and visited by a physiotherapist an average of 4.6 times. The control group subjects (41) were discharged to a rehabilitation centre for further treatment lasting on average 36.2 days (SD 14.6) and they received physiotherapy daily.

MAIN OUTCOME MEASURES: Ambulation ability measured on a categorical scale.

RESULTS: The mean age of the subjects was 75 years (SD 8.3 years). Females comprised 60% of all the subjects and majority were retired or home makers. Both groups of patients improved in their ambulation ability during their rehabilitation period but neither group achieved their pre-ambulatory status by the time of completion of the study. The study group achieved significantly higher ambulation scores ($p < 0.05$) for community and household ambulation compared with the control group by the end of the study, a year after operation.

CONCLUSION: Five visits by a physiotherapist in the patient's home after discharge from an acute hospital after surgical treatment for hip fracture yielded better results in ambulation ability than one month of conventional institution-based rehabilitation.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 12194626

Rating: 2c

Larsen K, Hvass KE, Hansen TB, Thomsen PB, Søballe K. Effectiveness of accelerated perioperative care and rehabilitation intervention compared to current intervention after hip and knee arthroplasty. A before-after trial of 247 patients with a 3-month follow-up. BMC Musculoskelet Disord. 2008 Apr 28;9:59.

Orthopedic Research Unit, Regional Hospital Holstebro, Denmark. fekl2004@msn.com

RESULTS: We included a total of 247 patients. Mean LOS was significantly ($P < 0.001$) reduced by 4.4 (95% CI 3.8-5.0) days after implementation of the accelerated intervention, from 8.8 (SD 3.0) days before implementation to 4.3 (SD 1.8) days after implementation. CONCLUSION: Accelerated perioperative

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care and rehabilitation intervention after hip and knee arthroplasty was successfully and effectively implemented.

PMID: 18442380

Rating: 2b

Mobilization started on the day of surgery. The first postoperative day, the goal was 4 hours out of bed, including training with physiotherapist and occupational therapist. We tried to achieve more than 8 hours of mobilization per day for the rest of the hospital stay. Mobilization consisted of all activities out of bed (70% of mobilization time), gait training (15% of mobilization time), and exercises (15% of mobilization time). The physiotherapist was responsible for coaching the patient during exercises and gait training. Exercises focused on strengthening hip and knee muscles and how to avoid restricted movements.

Lauridsen UB, de la Cour BB, Gottschalck L, Svensson BH. Intensive physical therapy after hip fracture. A randomised clinical trial. Dan Med Bull. 2002 Feb;49(1):70-2.

H:S Copenhagen Municipal Hospital, Department of Rheumatology.

INTRODUCTION: This randomised study evaluates the effect of intensive physical therapy on the duration of rehabilitation following hip fracture.

METHODS: Eighty-eight patients transferred for rehabilitation after surgical treatment for hip fracture were included in the trial. Forty-four patients were randomised to physical therapy 3.6 hours (median) a week, while the 44 control patients received physical therapy 1.9 hours a week. Outcome was defined as duration of physical rehabilitation until the patient was able to (1) walk 50 metres in less than 2 minutes, (2) manage stair climbing to the first floor, (3) manage sit-to-stand transfer, (4) move in and out of bed, (5) manage bathing, dressing and lavatory visits.

RESULTS: In the group randomised to intensive physical therapy 24 patients withdrew after 15 days while 13 patients withdrew from the control group after 22 days (median values). Early withdrawal was due to orthopaedic complications, general weakness and poor co-operation. No difference between the two groups was demonstrated in the duration of physical rehabilitation by a per protocol analysis of the patients who completed the trial.

DISCUSSION: The considerable drop-out rate suggests that intensive physical therapy may be of limited value when attempting to reduce the duration of rehabilitation following hip fracture. An altered objective including enhanced out-patient rehabilitation may be necessary in order to reduce the length of hospital stay after hip fracture.

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Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 11894727

Rating: 2c

Mangione KK, Craik RL, Tomlinson SS, Palombaro KM. Can elderly patients who have had a hip fracture perform moderate- to high-intensity exercise at home? *Phys Ther.* 2005 Aug;85(8):727-39.

Arcadia University, Department of Physical Therapy, Health Sciences Center, Glenside, PA 19038, USA.
mangione@arcadia.edu

BACKGROUND AND PURPOSE: The majority of patients after a hip fracture do not return to prefracture functional status. Depression has been shown to affect recovery. Although exercise can reduce impairments, access issues limit elderly people from participating in facility-based programs. The primary purpose of this study was to determine the effects and feasibility of a home exercise program of moderate- or high-intensity exercise. A secondary purpose was to explore the relationship of depression and physical recovery.

SUBJECTS: Thirty-three elderly people (24 women, 9 men; mean = 78.6 years of age, SD = 6.8, range = 64-89) who had completed a regimen of physical therapy following hip fracture participated in the study. Subjects were randomly assigned to a resistance training group, an aerobic training group, or a control group.

METHODS: Subjects were tested before and upon completion of the exercise trial. Isometric lower-extremity force, 6-minute-walk distance, free gait speed, mental status, and physical function were measured. Each exercise session was supervised by a physical therapist, and subjects received 20 visits over 12 weeks. The control group received biweekly mailings. The resistance training group performed 3 sets of 8 repetitions at the 8-repetition maximum intensity using a portable progressive resistance exercise machine. The aerobic training group performed activities that increased heart rate 65% to 75% of their age-predicted maximum for 20 continuous minutes.

RESULTS: Resistance and aerobic training were performed without apparent adverse effects, and adherence was 98%. All groups improved in distance walked, force produced, gait speed, and physical function. Isometric force improved to a greater extent in the intervention groups than in the control group. Depressive symptoms interacted with treatment group in explaining the outcomes of 6-minute-walk distance and gait speed.

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DISCUSSION AND CONCLUSION: High-intensity exercise performed in the home is feasible for people with hip fracture. Larger sample sizes may be necessary to determine whether the exercise regimen is effective in reducing impairments and improving function. Depression may play a role in the level of improvement attained.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 16048421

Rating: 2c

National Osteoporosis Foundation. Health professional's guide to rehabilitation of the patient with osteoporosis. Washington (DC): National Osteoporosis Foundation; 2003.

MAJOR RECOMMENDATIONS

Following hip fracture, physical therapy and exercise can improve transfers, gait, leg strength, flexibility, and balance. A total body exercise program also should include guided progression as strength improves.

Rehabilitation Following Hip Fracture

Hip fracture is a traumatic event that typically requires surgery to repair the fracture or replace the hip joint. It is important to regain as much mobility and independence as possible following hip fracture and to take steps to prevent future fractures. As the patient improves in terms of reduced pain and greater mobility, physical therapy and exercise programs can improve gait, leg strength, flexibility, and balance. A trained caregiver can safely assist the patient from a walker to a cane to unaided walking as her/his underlying health and physical status permits. Exercise principles should focus on hip-strengthening exercises. Fall prevention strategies should be implemented and should include a home-safety risk assessment and balance training. Slow-movement exercises, such as Tai Chi, should be encouraged. See the following

Simple Hip-Strengthening Exercises

Hip-flexors — Standing beside a chair, without bending at the waist, bend one knee up as close to chest as possible. Lower leg to floor. Repeat with other leg.

Hip abductors — Standing erect and holding onto the back of a chair, without bending at the waist or knee, move one leg straight out to the side, making sure that the toes point forward. Lower the leg and repeat on other side.

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Hip-extensors — Stand holding onto the back of a chair, and bend forward about 45 degrees at the hips. Lift one leg straight out behind you as high as possible without bending the knee or moving the upper body. Lower leg and repeat on other side.

Hip Protectors

Hip protective pads, worn in the side pockets of stretchy undergarments, were shown to protect against hip fractures in an elderly nursing home population, but compliance is difficult to obtain. However, these devices should be considered for elderly individuals at risk for hip fracture following a fall.

Publication Type:

- Nationally Recognized Treatment Guideline

Rating: 6a

Penrod JD, Boockvar KS, Litke A, Magaziner J, Hannan EL, Halm EA, Silberzweig SB, Sean Morrison R, Orosz GM, Koval KJ, Siu AL. Physical therapy and mobility 2 and 6 months after hip fracture. J Am Geriatr Soc. 2004 Jul;52(7):1114-20.

Program of Research on Serious Physical and Mental Illness and Geriatric Research, Education, and Clinical Center, Bronx Veterans Affairs Medical Center, New York, New York, USA.

joan.penrod@mssm.edu

OBJECTIVES: To examine the relationship between early physical therapy (PT), later therapy, and mobility 2 and 6 months after hip fracture. **DESIGN:** Prospective, multisite observational study.

SETTING: Four hospitals in the New York City area.

PARTICIPANTS: Four hundred forty-three hospitalized older patients discharged after surgery for hip fracture in 1997-98.

MEASUREMENTS: Patient demographics, fracture type, comorbidities, dementia, number of new impairments at discharge, amount of PT between day of surgery and postoperative day (POD) 3, amount of therapy between POD4 and 8 weeks later, and prefracture, 2-, and 6-month mobility measured using the Functional Independence Measure.

RESULTS: More PT immediately after hip fracture surgery was associated with significantly better locomotion 2 months later. Each additional session from the day of surgery through POD3 was associated with an increase of 0.4 points ($P=.032$) on the 14-point locomotion scale, but the positive relationship between early PT and mobility was attenuated by 6 months postfracture. There was no association between later therapy and 2- or 6-month mobility.

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CONCLUSION: PT immediately after hip fracture surgery is beneficial. The effects of later therapy on mobility were difficult to assess because of limitations of the data. Well-designed randomized, controlled trials of the effect of varying schedules and amounts of therapy on functional status after hip fracture would be informative.

Publication Types:

- Multicenter Study

PMID: 15209649

Rating: 2b

Sherrington C, Lord SR, Herbert RD. A randomized controlled trial of weight-bearing versus non-weight-bearing exercise for improving physical ability after usual care for hip fracture. Arch Phys Med Rehabil. 2004 May;85(5):710-6.

Prince Wales Medical Research Institute, University of New South Wales, Sydney, Australia.
c.sherrington@unsw.edu.au

OBJECTIVE: To compare the effects of weight-bearing and non-weight-bearing home exercise programs and a control program on physical ability (strength, balance, gait, functional performance) in older people who have had a hip fracture.

DESIGN: Randomized controlled trial with 4-month follow-up.

SETTING: Australian community-dwellers (82%) and residents of aged care facilities who had completed usual care after a fall-related hip fracture.

PARTICIPANTS: One hundred twenty older people entered the trial, 40 per group (average age +/- standard deviation, 79+/-9y) and 90% completed the 4-month retest.

INTERVENTION: Home exercise prescribed by a physical therapist.

MAIN OUTCOME MEASURES: Strength, balance, gait, and functional performance.

RESULTS: At the 4-month retest, there were differences between the groups in the extent of improvement since the initial assessment for balance ($F(10,196)=2.82, P<.001$) and functional performance ($F(6,200)=3.57, P<.001$), but not for strength ($F(12,190)=1.09, P=.37$) or gait ($F(8,200)=.39, P=.92$). The weight-bearing exercise group showed the greatest improvements in measures of balance and functional performance (between-group differences of 30%-40% of initial values).

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CONCLUSIONS: A weight-bearing home exercise program can improve balance and functional ability to a greater extent than a non-weight-bearing program or no intervention among older people who have completed usual care after a fall-related hip fracture.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 15129393

Rating: 2b

Tsauo JY, Leu WS, Chen YT, Yang RS. Effects on function and quality of life of postoperative home-based physical therapy for patients with hip fracture. Arch Phys Med Rehabil. 2005 Oct;86(10):1953-7.

School and Graduate Institute of Physical Therapy, College of Medicine, National Taiwan University, Taipei.

OBJECTIVE: To evaluate the effects of a 3-month home-based physical therapy (PT) program for patients with hip fracture after surgery. **DESIGN:** Randomized controlled trial.

SETTING: Home.

PARTICIPANTS: Twenty-five patients recently discharged from an acute orthopedic department.

INTERVENTIONS: Patients were randomized to the home-based PT group (n=13), where they received home-based PT 8 times from discharge to month 3 postdischarge, or to the control group (n=12). The home-based PT program included exercises for muscle strengthening, range of motion (ROM), balance, and functional training. Patients in the control group were instructed to practice the exercise program given at bedside before discharge.

MAIN OUTCOME MEASURES: Patients were evaluated for hip ROM, strength, walking velocity, Harris hip score, and health-related quality of life (HRQOL) at the week of discharge and at 1, 3, and 6 months after discharge.

RESULTS: The baseline characteristics showed no difference between the 2 groups. Harris score of the home-based PT group progressed from 58.6+/-8.5 to 90.1+/-5.4 at month 3, whereas Harris score of the control group progressed from 54.6+/-14.5 to 77.4+/-10.0 (P<.01). Scores of the psychologic domain of HRQOL for the home-based PT group were significantly better at month 1 (P<.05) and month 3 (P<.01)

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after discharge. Moreover, the physical domain score of the home-based PT group was also significantly better ($P < .05$) at 3 months after discharge.

CONCLUSIONS: Home-based PT programs could help patients regain function and HRQOL earlier.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 16213237

Rating: 2c

White SC, Lifeso RM. Altering asymmetric limb loading after hip arthroplasty using real-time dynamic feedback when walking. Arch Phys Med Rehabil. 2005 Oct;86(10):1958-63.

Department of Exercise and Nutrition Sciences, State University of New York, Buffalo, NY 14214-3079, USA. swhite@acsu.buffalo.edu

OBJECTIVE: To evaluate a walking program incorporating real-time biofeedback to reduce asymmetric limb loading after total hip arthroplasty (THA).

DESIGN: Within-subject clinical intervention.

SETTING: Biomechanics laboratory.

PARTICIPANTS: Volunteers were screened for confounding disorders that could affect their gait other than unilateral THA. Participants included 28 subjects who were evaluated a minimum of 2 months after surgery and ambulatory without assistive devices.

INTERVENTIONS: THA subjects were assigned to a feedback, no-feedback, or control group. The feedback group walked on a treadmill 15 minutes, 3 times a week for 8 weeks while matching step-to-step reaction forces. Subjects walking without feedback had equal time. The control group did not train.

MAIN OUTCOME MEASURES: Symmetry indices for peak limb-loading force, rate of rise of loading force, and impulse calculated from vertical foot-ground forces. Symmetry index changes were evaluated using 2-factor, repeated-measures analyses of variance with a Tukey post hoc test.

RESULTS: Loading rate and impulse equalization improved for the feedback group ($P < .01$). Loading rate equalization improved for the no-feedback group ($P = .01$). There were no changes for the control group.

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CONCLUSIONS: This preliminary study suggests that a treadmill walking program may help persons with a THA achieve a more symmetric gait. Additional investigation of the potential benefits of a rehabilitation program incorporating treadmill walking with and without biofeedback is recommended.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 16213238

Rating: 2c

Knee

Goodwin PC, Morrissey MC, Omar RZ, Brown M, Southall K, McAuliffe TB, Effectiveness of supervised physical therapy in the early period after arthroscopic partial meniscectomy, *Phys Ther.* 2003 Jun;83(6):520-35

Centre for Applied Biomedical Research, GKT School of Biomedical Sciences, King's College London, London, United Kingdom.

BACKGROUND AND PURPOSE: Controversy exists about the effectiveness of physical therapy after arthroscopic partial meniscectomy. This randomized controlled trial evaluated the effectiveness of supervised physical therapy with a home program versus a home program alone.

SUBJECTS: Eighty-four patients (86% males; overall mean age=39 years, SD=9, range=21-58; female mean age=39 years, SD=9, range=24-58; male mean age=40, SD=9, range=21-58) who underwent an uncomplicated arthroscopic partial meniscectomy participated.

METHODS: Subjects were randomly assigned to either a group who received 6 weeks of supervised physical therapy with a home program or a group who received only a home program. Blinded test sessions were conducted 5 and 50 days after surgery. Outcome measures were: (1) Hughston Clinic questionnaire, (2) Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) and EuroQol EQ-5D (EQ-5D) questionnaires, (3) number of days to return to work after surgery divided by the Factor Occupational Rating System score, (4) kinematic analysis of knee function during level walking and stair use, and (5) horizontal and vertical hops.

RESULTS: No differences between groups were found for any of the outcomes measured.

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DISCUSSION AND CONCLUSION: The results indicate that the supervised physical therapy used in this study is not beneficial for patients in the early period after uncomplicated arthroscopic partial meniscectomy.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 12775198

Rating: 2b

Larsen K, Hvass KE, Hansen TB, Thomsen PB, Søballe K. Effectiveness of accelerated perioperative care and rehabilitation intervention compared to current intervention after hip and knee arthroplasty. A before-after trial of 247 patients with a 3-month follow-up. *BMC Musculoskelet Disord*. 2008 Apr 28;9:59.

Orthopedic Research Unit, Regional Hospital Holstebro, Denmark. fekl2004@msn.com

RESULTS: We included a total of 247 patients. Mean LOS was significantly ($P < 0.001$) reduced by 4.4 (95% CI 3.8-5.0) days after implementation of the accelerated intervention, from 8.8 (SD 3.0) days before implementation to 4.3 (SD 1.8) days after implementation. **CONCLUSION:** Accelerated perioperative care and rehabilitation intervention after hip and knee arthroplasty was successfully and effectively implemented.

PMID: 18442380

Rating: 2b

Mobilization started on the day of surgery. The first postoperative day, the goal was 4 hours out of bed, including training with physiotherapist and occupational therapist. We tried to achieve more than 8 hours of mobilization per day for the rest of the hospital stay. Mobilization consisted of all activities out of bed (70% of mobilization time), gait training (15% of mobilization time), and exercises (15% of mobilization time). The physiotherapist was responsible for coaching the patient during exercises and gait training. Exercises focused on strengthening hip and knee muscles and how to avoid restricted movements.

Minns Lowe CJ, Barker KL, Dewey M, Sackley CM. Effectiveness of physiotherapy exercise after knee arthroplasty for osteoarthritis: systematic review and meta-analysis of randomised controlled trials. *BMJ*. 2007 Oct 20;335(7624):812. Epub 2007 Sep 20.

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OBJECTIVE: To evaluate the effectiveness of physiotherapy exercise after elective primary total knee arthroplasty in patients with osteoarthritis.

DESIGN: Systematic review.

DATA SOURCES: Database searches: AMED, CINAHL, Embase, King's Fund, Medline, Cochrane library (Cochrane reviews, Cochrane central register of controlled trials, DARE), PEDro, Department of Health national research register. Hand searches: Physiotherapy, Physical Therapy, Journal of Bone and Joint Surgery (Britain) Conference Proceedings. Review methods Randomised controlled trials were reviewed if they included a physiotherapy exercise intervention compared with usual or standard physiotherapy care, or compared two types of exercise physiotherapy interventions meeting the review criteria, after discharge from hospital after elective primary total knee arthroplasty for osteoarthritis.

OUTCOME MEASURES: Functional activities of daily living, walking, quality of life, muscle strength, and range of motion in the knee joint. Trial quality was extensively evaluated. Narrative synthesis plus meta-analyses with fixed effect models, weighted mean differences, standardised effect sizes, and tests for heterogeneity. **RESULTS:** Six trials were identified, five of which were suitable for inclusion in meta-analyses. There was a small to moderate standardised effect size (0.33, 95% confidence interval 0.07 to 0.58) in favour of functional exercise for function three to four months postoperatively. There were also small to moderate weighted mean differences of 2.9 (0.61 to 5.2) for range of joint motion and 1.66 (-1 to 4.3) for quality of life in favour of functional exercise three to four months postoperatively. Benefits of treatment were no longer evident at one year. **CONCLUSIONS:** Interventions including physiotherapy functional exercises after discharge result in short term benefit after elective primary total knee arthroplasty. Effect sizes are small to moderate, with no long term benefit.

PMID: 17884861

Rating: 1b

September 24, 2007 — Functional exercises after discharge from the hospital result in a small to moderate short-term, but not long-term, benefit after elective primary total knee arthroplasty, according to an analysis of interventions from randomized trials, including physiotherapy, reported in the September 20 Online First issue of the BMJ. "As the length of hospital stay after joint arthroplasty surgery has markedly and rapidly decreased, and given that patients who undergo knee arthroplasty may still experience considerable functional impairment postoperatively, the effectiveness of physiotherapy after discharge is a valid question," write Catherine J. Minns Lowe, from the University of Birmingham, United Kingdom, and colleagues. "The present uncertainty regarding effectiveness makes it difficult for commissioning organisations, healthcare practitioners, and patients to make decisions regarding such physiotherapy." Limitations of this review include possible failure to identify all pertinent studies, some studies that were relatively small and not included in the review, limited usefulness of range of motion in the knee as an outcome measure of physiotherapy interventions, no direct measurements of muscle strength in any of the trials, and limited number and size of available studies. "Presently, given the reduction in length of hospital stay, compressed inpatient rehabilitation, and the limitations of the available evidence, it seems

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reasonable to refer patients for a short course of physiotherapy after discharge to provide short term benefit," the review authors conclude. "While range of motion may be limited as an outcome measure of physiotherapy, the small to moderate standardised effect size obtained for function, which favours the intervention, is considered clinically important.... In the short term physiotherapy exercise interventions with exercises based on functional activities may be more effective after total knee arthroplasty than traditional exercise programmes, which concentrate on isometric muscle exercises and exercises to increase range of motion in the joint." Two of the review authors have disclosed financial relationships with the Department of Health and National Health Service research and development. In an accompanying editorial, Rob Herbert, PhD, and Marlene Fransen, PhD, MPH, from the University of Sydney and George Institute for International Health, also in Sydney, Australia, describe the findings of this meta-analysis as "provisional at best." In 4 of the 6 trials included in the review, all study participants were assigned either an exercise or physiotherapy program after hospital discharge; therefore, the effects of an exercise intervention could not be isolated. The other 2 trials focused on the effects of outpatient programs on the range of knee flexion and found little or no effect. "Most of the trials evaluated low intensity exercise programmes provided soon after surgery," Drs. Herbert and Fransen write. "More lengthy and intensive physiotherapy exercise programmes may be needed to overcome the considerable deficits in muscle strength and endurance that are evident in these patients.... It is difficult to make clinical recommendations on the basis of Minns Lowe and colleagues' review, although it does highlight the lack of research into the effectiveness of physiotherapy exercise programmes after total knee replacement."

Clinical Context: In elderly people, osteoarthritis is the most frequent cause of disability, with more than 80% of patients limited in activities of daily living including work, housework, and mobility outside the home. Given the trend toward reduced length of hospital stay after joint arthroplasty and the considerable functional postoperative impairment after knee arthroplasty, there is a need to determine the efficacy of physiotherapy after discharge. The existing uncertainty on the efficacy of physiotherapy in this setting hinders well-reasoned decisions regarding physiotherapy by third-party payers, clinicians, and patients. This systematic review of randomized controlled trials examined the effectiveness of physiotherapy exercise after hospital discharge for elective primary unilateral total knee arthroplasty in improving function, quality of life, walking, range of motion in the knee, and muscle strength.

Study Highlights: Of 27 potentially relevant studies, 6 trials were identified that met inclusion criteria for review, and 5 were suitable for meta-analyses with fixed-effect models, weighted mean differences, standardized effect sizes, and tests for heterogeneity. The number of participants was 554 in the 5 trials included in the meta-analyses, and 614 participants were included overall in the review. In 4 of the 6 trials included, all study participants were assigned either an exercise or physiotherapy program after hospital discharge; therefore, the effects of an exercise intervention could not be isolated. The other 2 trials focused primarily on the effects of outpatient programs on the range of flexion in the joint, which had little or no effect.

Pearls for Practice: Physiotherapy functional exercise was associated with small to moderate, short-term benefits in improved function, range of motion in the knee, and quality of life 3 to 4 months after elective primary total knee arthroplasty for osteoarthritis. At 1 year, any benefits of treatment seen 3 to 4 months after surgery were no longer apparent.

Low Back

Erdogmus CB, Resch KL, Sabitzer R, Müller H, Nuhr M, Schögl A, Posch M, Osterode W, Ungersböck K, Ebenbichler GR. Physiotherapy-based rehabilitation following disc herniation operation: results of a randomized clinical trial. *Spine*. 2007 Sep 1;32(19):2041-9.

Department of Physical Medicine & Rehabilitation, Vienna Medical University, Vienna, Austria.

STUDY DESIGN: Three-group, randomized, single blinded, controlled trial.

OBJECTIVE: To test the effectiveness of physiotherapy-based rehabilitation starting 1 week after lumbar disc surgery. In addition, we tried to estimate the contribution of specific effects to the observed outcome (efficacy).

SUMMARY OF BACKGROUND DATA: Physiotherapy-based rehabilitation is usually recommended for patients following lumbar disc surgery. Few and conflicting data exist for the relative effectiveness of this intervention.

METHODS: A total of 120 patients following first-time, uncomplicated lumbar disc surgery were randomly assigned to "comprehensive" physiotherapy, "sham" neck massage, or no therapy. Before enrollment, all subjects completed a minimal physiotherapeutic intervention. Physiotherapy was administered by experienced physiotherapists and consisted of 20 sessions per patient over 12 weeks. Masseurs administered "sham massage" to the neck. The amount of treatment time was equal to that of physiotherapy. The main outcome measure was the Low Back Pain Rating Score (LBPRS) at 6 and 12 weeks, and 1.5 years after randomization. Secondary parameters were patients' overall satisfaction with treatment outcome and socioeconomic and psychologic measures.

RESULTS: At the end of therapy (12 weeks), the LBPRS revealed a significantly better improvement in the physiotherapy group than in the untreated group. LBPRS outcome, however, did not significantly differ between physiotherapy and "sham" therapy. There was a tendency toward significance between the sham therapy and no therapy. Within the 1.5-year follow-up, LBP rating scales remained significantly improved compared with baseline, but there were no significant outcome differences. No statistically significant between-group differences were found for the secondary outcome parameters.

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CONCLUSION: As compared with no therapy, physiotherapy following first-time disc herniation operation is effective in the short-term. Because of the limited benefits of physiotherapy relative to "sham" therapy, it is open to question whether this treatment acts primarily physiologically in patients following first-time lumbar disc surgery, but psychological factors may contribute substantially to the benefits observed.

PMID: 17762803

Rating: 2b

Neck & Upper Back

[No postsurgical physical medicine references.]

Shoulder

[No postsurgical physical medicine references.]

Explanation of Medical Literature Ratings

(Ratings “1a” through “11c” noted under summary of each study)

Ranking by Type of Evidence:

(click on links to go to explanation)

STUDIES

1. Systematic Review/Meta-Analysis
2. Controlled Trial – Randomized (RCT) or Controlled
3. Cohort Study - Prospective or Retrospective
4. Case Series
5. Unstructured Review

OTHER:

6. Nationally Recognized Treatment Guideline (from guidelines.gov)
7. State Treatment Guideline
8. Other Treatment Guideline
9. Textbook
10. Conference Proceedings/Presentation Slides
11. Case Reports and Descriptions

Ranking by Quality within Type of Evidence:

(click on links to go to explanation)

- a. High Quality
- b. Medium Quality
- c. Low Quality

Ranking by Type of Evidence

1. Systematic Review/Meta-Analysis

Systematic Reviews: Written by reviewers who use explicit and rigorous methods to identify, critically appraise, and synthesize relevant studies from the published medical research. They use the process of systematically locating, appraising and synthesizing evidence from scientific studies in order to obtain a reliable overview. The function of a systematic review is: 1) to summarize the literature and 2) to provide new information that may not be readily apparent from individual studies where the effects are small, but become apparent in when the data from many studies are pooled together. Example: Cochrane Database of Systematic Reviews.

Meta-analysis: A type of systematic review that is an overview and also uses quantitative methods to summarize the results. A quantitative method of combining the results of independent studies (usually drawn from the published literature) and synthesizing summaries and conclusions which may be used to evaluate therapeutic effectiveness, plan new studies, etc., with application chiefly in the areas of research

and medicine. Any study with the Level 1 ranking in ODG must have been accepted for publication in a peer reviewed journal, and that journal must be one of the journals accepted for inclusion in MEDLINE[®] by the National Library of Medicine. For this Journal Selection Criteria, see www.nlm.nih.gov/pubs/factsheets/jssel.html. Unpublished studies, or studies in magazines that do not publish original research, would not receive this ranking.

2. Controlled Trial – Randomized (RCT) or Controlled

These are analytical experimental studies, where variables can be better controlled on a prospective basis. In a RCT (Randomized Controlled Clinical Trial), a group of patients is randomized into an experimental group and a control group. These groups are followed up for the variables/outcomes of interest. Advantages: Unbiased distribution of confounders; Blinding more likely; Randomization facilitates statistical analysis. Disadvantages: Expensive: time and money; Volunteer selection bias; Ethically problematic at times. Any study with the Level 2 ranking in ODG must have been accepted for publication in a peer reviewed journal, and that journal must be one of the journals accepted for inclusion in MEDLINE[®] by the National Library of Medicine. Unpublished studies, or studies in magazines that do not publish original research, would not receive this ranking.

3. Cohort Study - Prospective or Retrospective

Analytical observational studies involving identification of two groups (cohorts) of patients, one which did receive the exposure of interest, and one which did not, and following these cohorts forward for the outcome of interest. Advantages: Ethically safe; Subjects can be matched; Can establish timing and direction of events; Eligibility criteria and outcome assessments can be standardized; Administratively easier and cheaper than RCT. Disadvantages: Controls may be difficult to identify; Exposure may be linked to a hidden confounder; Blinding is difficult; Randomization not present; For rare disease, large sample sizes or long follow-up necessary. Any study with the Level 3 ranking in ODG must have been accepted for publication in a peer reviewed journal, and that journal must be one of the journals accepted for inclusion in MEDLINE[®] by the National Library of Medicine.

4. Case Series

Analytical observational studies involving identifying groups of patients who have the outcome or treatment of interest (cases) and quantifying the results. Ideally, control patients without the same outcome are also tracked, looking back to see if they had the exposure of interest. (The use of controls would influence the quality rating of a Case Series.) Generally, since the minimum ODG quality rating for studies (“c”) requires at least 10 cases, there must be 10 or more cases for a study to be classified as a Case Series, and otherwise the article would be classified in ODG as Case Reports and Descriptions. Advantages of Case Series: Quick and cheap; Only feasible method for very rare disorders or those with long lag between exposure and outcome; Fewer subjects needed than cross-sectional studies. Disadvantages: Reliance on recall or records to determine exposure status; Confounders; Selection of control groups is difficult; Potential bias: recall, selection. Any study with the Level 4 ranking in ODG must have been accepted for publication in a peer reviewed journal, and that journal must be one of the journals accepted for inclusion in MEDLINE[®] by the National Library of Medicine.

5. Unstructured Review

Descriptive (versus analytical) and observational (versus experimental) studies, written by reviewers who describe current practice as well as relevant studies from the published medical research, with no attempt to pool the results analytically. Compared to Systematic Reviews, an Unstructured Review makes little attempt to quantify outcomes based on the body of evidence described. Any study with the Level 5 ranking in ODG must have been accepted for publication in a peer reviewed journal, and that journal must be one of the journals accepted for inclusion in MEDLINE[®] by the National Library of Medicine.

6. Nationally Recognized Treatment Guideline (from guidelines.gov)

Accepted for inclusion in the National Guideline Clearinghouse by the Federal Agency for Healthcare Research & Quality (AHRQ), which requires that the guideline recommendations be based on a systematic literature search and review of scientific studies published in peer reviewed journals, and revised on a regular basis to maintain currency with new studies.

7. State Treatment Guideline

Treatment guidelines created for use in a specific state in the U.S., or for use in a province in Canada, or for use by another governmental entity, and they have the backing of the respective jurisdictional or governmental authority.

8. Other Treatment Guideline

Other treatment guidelines. These are typically national treatment guidelines not accepted in the National Guideline Clearinghouse, in many cases because the guideline publishers have chosen not to apply for inclusion (for example, commercial guidelines such as Milliman, McKesson, InterQual, etc.), or because they are private guidelines created for use under the terms of a specific health insurance policy (for example, Blue Cross, Medicare, Aetna, Cigna, United Healthcare, etc.). Since studies by healthcare insurers are generally given a rating of Level 8, they are not characterized in ODG as among the highest quality references when there are numerous other studies available. However, when there are limited studies available with the high quality ratings, it may be necessary to identify other studies that could provide guidance on a subject. In fact, many of the healthcare insurance provider structured reviews are very high quality, they represent a thorough analysis and quantitative weighting of all available evidence on a subject, including unpublished studies that the insurer may have conducted, and these healthcare insurance reviews might even rank as Level 1 if they were published in the peer-reviewed literature and available in MEDLINE[®]. Furthermore, the fact that a particular treatment is either covered or not covered by healthcare insurance should be relevant to coverage decisions in workers' compensation.

9. Textbook

Medical reference texts, which may represent standards of practice, but which in and of themselves, are not necessarily evidence based versus consensus based or based primarily on the personal experiences of the authors.

10. Conference Proceedings/Presentation Slides

These are studies that have not been published in peer reviewed journals.

11. Case Reports and Descriptions

Descriptive articles published in the peer reviewed journals covering individual cases, and lacking any comparisons to controls. Generally, since the minimum ODG quality rating for studies ("c") requires at least 10 cases, there must be 10 or more cases for a study to be classified as a Case Series, and otherwise the article would be classified in ODG as Case Reports and Descriptions. These articles were not included in the evidence base for any treatment guidelines except for the Council on Chiropractic Guidelines for Practice Parameters (CCGPP) chiropractic practice guidelines.

Ranking by Quality within Type of Evidence:

In evaluating clinical trials ODG has adopted the standards from the "Cochrane Handbook for Systematic Reviews of Interventions," as updated in September 2006. (Higgins, 2006) Specific additional criteria used by ODG include the following:

a. High Quality

Sample size: Generally over 300, but at least 100, depending on other factors below.

Conflict of interest: Authors and researchers had no financial interest in the product or service being studied.

Study design: Ideally, blinded. No identifiable bias, including recall bias, confounding factors, selection bias, compliance bias, non-response bias, or measurement bias. If a case series, should be a case control series.

Statistical significance: 99% Confidence level that the outcomes likelihood ratio will not cross 1.0 (i.e., the p value is .01).

b. Medium Quality

Sample size: From 20-50 up to 100-300, depending on other factors below.

Conflict of interest: Authors and researchers had no financial interest in the product or service being studied.

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Study design: No significant bias, including recall bias, confounding factors, selection bias, compliance bias, non-response bias, or measurement bias. If a case series, should be a case control series.

Statistical significance: 95% Confidence level that the likelihood ratio will not cross 1.0 (i.e., the p value is .05).

c. Low Quality

Sample size: Generally under 20-50, depending on other factors below, but no less than 10.

Conflict of interest: Authors and researchers may have had some financial interest in the product or service being studied, even if the sample size was large.

Study design: Some obvious bias, including recall bias, confounding factors, selection bias, compliance bias, non-response bias, or measurement bias.

Statistical significance: Does not meet the 95% Confidence level that the likelihood ratio will not cross 1.0 (i.e., the p value is .05).

Link between evidence and recommendations

ODG Treatment is being updated quarterly on the Web. The Contents page indicates the last date updated for each chapter. The hard copy version is published once a year, but this is not recommended since it does not link into the actual studies, and it is not as current as the Web version.

The heart of each chapter in *ODG Treatment* is the "Procedure Summary", which provides a concise synopsis of effectiveness, if any, based on existing medical evidence, hyper-linked directly into the studies on which they are based, in abstract form, which have been ranked, highlighted and indexed. The "Treatment Planning" section identifies the ideal treatment plans that may be followed after illness or injury, based on the "Procedure Summary". "Codes for Automated-Approval" maps procedure codes to ICD-9 diagnosis codes based on the ideal treatment protocol, with a field for "maximum occurrences", for auto-approval of charges that meet the guideline.

For example, in the Low Back chapter, under Fusion, it says, "Not recommended in the absence of fracture, dislocation, or instability", so the Treatment Protocol does not include fusion. Same for IDET, facet injections, etc., etc. Under Epidural injections, it says, "Recommended as an option prior to surgery when there are radicular signs... and the number of injections should be limited to two...", so the Treatment Protocol for "With Radiculopathy" includes 2 ESI's, and the Codes for Auto Approval includes CPT code 62311 (Epidural steroid injection) 2 times for ICD9 722.x (Intervertebral disc disorders).

This effort to translate the evidence into specific auto-authorization protocols is unique, for pre-approval of treatment plans and triage of claims management. Of course, most cases will not meet this ideal protocol, and that is where the many other listings in the Procedure Summary come into play.

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In a recent pilot use of these Codes for Auto Approval reduced medical costs by 64%, cut lost days by 69%, minimized treatment delays for injured workers, and drew considerable praise from providers. (Ohio ODG Pilot, Comp Management, 2005)

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Higgins JPT, Green S, editors. Cochrane Handbook for Systematic Reviews of Interventions 4.2.5. In: The Cochrane Library, Issue 3, 2005. Chichester, UK: John Wiley & Sons, Ltd. September 2006.

6. ASSESSMENT OF STUDY QUALITY

6.0 Quality assessment of studies

Quality assessment of individual studies that are summarized in systematic reviews is necessary to limit bias in conducting the systematic review, gain insight into potential comparisons, and guide interpretation of findings. Factors that warrant assessment are those related to applicability of findings, validity of individual studies, and certain design characteristics that affect interpretation of results. Applicability, which is also called external validity or generalize-ability by some, is related to the definition of the key components of well-formulated questions outlined in section 4. Specifically, whether a review's findings are applicable to a particular population, intervention strategy or outcome is dependent upon the studies selected for review, and on how the people, interventions and outcomes of interest were defined by these studies and the authors (reviewers).

6.1 Validity

In the context of a systematic review, the validity of a study is the extent to which its design and conduct are likely to prevent systematic errors, or bias. An important issue that should not be confused with validity is precision. Precision is a measure of the likelihood of chance effects leading to random errors. It is reflected in the confidence interval around the estimate of effect from each study and the weight given to the results of each study when an overall estimate of effect or weighted average is derived. More precise results are given more weight.

6.2 Sources of bias in trials of healthcare interventions

There are four sources of systematic bias in trials of the effects of healthcare: selection bias, performance bias, attrition bias and detection bias.

6.3 Selection bias

Participants and those who recruit should remain unaware of next assignment in sequence. Empirical research has shown that lack of allocation concealment is associated with bias. For that reason trials should use approaches such as allocation by a central office unaware of subject characteristics, pre-numbered or coded identical containers which are administered serially to participants, or an on-site computer system combined with allocations kept in an unreadable file that can be accessed only after the characteristics of enrolled participants have been entered.

6.4 Performance bias

This refers to systematic differences in the care provided to the participants in the comparison groups other than the intervention under investigation. To protect against unintended differences in care and

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placebo effects, those providing and receiving care can be "blinded" so that they did not know the group to which the recipients of care have been allocated.

6.5 Attrition bias

This refers to systematic differences between comparison groups in the loss of participants from the study. The study should consider how losses of participants (withdrawals, dropouts and protocol deviations) are handled.

6.6 Detection bias

This refers to systematic differences between the comparison groups in outcome assessment.

Rating: 1a