Clinical review

Extracts from "Clinical Evidence"

Hip fracture

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Background

Definition Hip fracture is a fracture of the femur above a point 5 cm below the distal part of the lesser trochanter.[1] Intracapsular fractures occur proximal to the point at which the hip joint capsule attaches to the femur. Undisplaced fractures include impacted or adduction fractures. Displaced intracapsular fractures may be associated with disruption of the blood supply to the head of the femur. Numerous subdivisions and classification methods exist for these fractures. In the most distal part of the proximal femoral segment (below the lesser trochanter), the term subtrochanteric is used. Extracapsular fractures occur distal to the hip joint capsule.

Incidence/prevalence Hip fractures may occur at any age but are most common in elderly people. In industrialised societies, the lifetime risk of hip fracture is about 18% in women and 6% in men.[2] A recent study reported that prevalence increases from about 3 per 100 women aged 65-74 to 12.6 per 100 women aged 85 or older.[3] The age stratified incidence has also increased in some societies during the past 25 years; not only are people living longer, but the incidence of fracture in each age group may have increased.[4]

Aetiology/risk factors Hip fractures are usually sustained through a fall from standing height or less. The pattern of incidence is consistent with two main risk factors: increased risk of falling, and loss of skeletal strength from osteoporosis. Both are associated with ageing.

Prognosis One in five people die in the first year after a hip fracture,[5] and one in four elderly people require a higher level of long term care after a fracture.[5 6] Those who do return to live in the community after a hip fracture have greater difficulty with activities of daily living than age and sex matched controls.[3]

Aims To improve survival and quality of life; to minimise complications and disability associated with hip fracture.

Outcomes Incidence of preoperative, operative, and postoperative complications (infection, venous thromboembolism, refracture, fixation failure, pressure sores, medical complications); proportion of people returning to previous residential and mobility status; rates of readmission to hospital and of reoperation; measures of mobility and competence in activities of daily living; health related quality of life measures.

Intervention

Beneficial:
Sliding hip screw device for internal fixation of extracapsular fracture
Antibiotic prophylaxis before surgery
Mattress on operating tables to prevent pressure sores

Likely to be beneficial:
Regional anaesthesia for surgery
Arthroplasty for displaced intracapsular fracture
Postoperative prophylaxis with heparin to reduce venous thromboembolism
Postoperative prophylaxis with antiplatelet agents to reduce venous thromboembolism
Postoperative prophylactic cyclical compression of the foot or calf to reduce venous thromboembolism
Nutritional supplementation after fracture
Geriatric hip fracture programmes in acute orthopaedic units

Trade off between benefits and harms:
Early supported discharge programmes

Unknown effectiveness:
Arthroplasty for extracapsular hip fracture
Nerve blocks for pain control
Use of graduated elastic compression to prevent venous thromboembolism
Specialised orthopaedic rehabilitation units for elderly people
Systematic home based rehabilitation

Unlikely to be beneficial:
Conservation (non-surgical) treatment of extracapsular fractures
Preoperative bed traction to the injured limb

Likely to be ineffective or harmful:
Intramedullary fixation with cephalocondylic nail for extracapsular fracture (less effective or more harmful than sliding hip screw)
Intramedullary fixation with condylocephalic nail for extracapsular fracture

Methods

We searched for any systematic reviews and randomised or quasi-randomised trials that evaluated a treatment or strategy relating to the prevention, management, or rehabilitation of proximal femoral fracture. This included any type of surgical or non-surgical intervention applied in the treatment of hip fracture, as well as any type of prophylactic treatment or dietary supplementation hypothesised to reduce the occurrence of complications of surgery or bed rest—for example, antibiotic prophylaxis, prophylaxis against venous thromboembolism, dietary supplements, rehabilitation after acute treatment of hip fracture. We searched Current Contents to March 2000, Medline to end February 2000, Embase to August 1999, CINAHL to December 1999, Cochrane Library to 2000 Issue 1, and Best Evidence to March 2000. We also scanned the bibliographies of included studies for additional references and contacted known trialists for up to date information.

Question What are the effects of specific surgical interventions in the treatment of hip fracture?

Option General versus regional anaesthesia for hip fracture surgery

Summary One systematic review of randomised controlled trials (RCTs) has found that regional anaesthesia may reduce mortality in the short term after hip fracture surgery in comparison to general anaesthesia and may be associated with a lower rate of deep venous thrombosis.

Benefits

We found one systematic review (search date 1998, 15 RCTs, 2162 participants).[7] Regional anaesthesia was associated with lower mortality at one month, (49/766 with regional anaesthesia *v* 76/812 with general anaesthesia; relative risk (RR) 0.68, 95% confidence interval 0.49 to 0.97; absolute risk reduction (ARR) 0.03; number needed to treat (NNT) 33). Too few people were seen at one year follow up to confirm any long term benefit. Regional anaesthesia was associated with a reduced risk of deep venous thrombosis (39/129 *v* 61/130 with general anaesthesia; RR 0.64, 0.48 to 0.86; ARR 0.169; NNT 6).

Harms

Regional anaesthesia was associated with a marginally longer operation time (weighted mean difference (WMD) 4.8 (1.1 to 8.6) minutes).

Comment

Although the pooled data indicated a significant reduction in risk of deep venous thrombosis, the three trials contributing data for this outcome had methodological limitations (probable selection and performance biases). Therefore, this association may be insecure.

Option Internal fixation versus joint arthroplasty for intracapsular hip fractures

Summary A systematic review of randomised and observational studies found limited evidence that mortality and morbidity after arthroplasty for displaced intracapsular fractures of the hip is similar to that with internal fixation.

Benefits

Arthroplasty versus internal fixation: We found one systematic review comparing internal fixation against arthroplasty in people aged over 65 with a displaced intracapsular fracture (search date 1997, 1 RCT, 105 non-randomised studies).[8] Overall, the review found no significant differences between the two options in terms of mortality, mobility, deep vein thrombosis, or pulmonary embolism. No health related quality of life data were available. Deep infection was slightly but significantly more common after arthroplasty than after internal fixation (no data provided). **Unipolar versus bipolar hemiarthroplasty:** We found no systematic review. We found two RCTs.[9 10] One RCT (250 people aged over 80, followed for two years) found that significantly more unipolar participants returned to preinjury status (numbers not given; odds ratio 1.94, 1.03 to 3.67).[9] The other RCT (48 people, mean age 77) found that at six months, performance in a 6 m walk was better after bipolar hemiarthroplasty (unipolar 1.93 (range 1.16-3.30) feet/second *v* bipolar 2.67 (0.77-4.86) feet/second).[10]

Harms

The need for reoperation was higher after internal fixation by 12-15 months (3 studies, arthroplasty 36/285 *v* fixation 75/170; RR 2.9, 1.7 to 5.3) and after 24 months (2 studies, arthroplasty 26/144 *v* fixation 61/194; RR 2.6, 1.4 to 4.6).[8]

Comment

The review included only one RCT. Protocols have been published for systematic reviews dealing with the management of displaced intracapsular fractures.

Option Conservative versus operative treatment for extracapsular hip fractures

Summary A systematic review of RCTs has found that leg deformity is more common after conservative treatment of extracapsular hip fractures. From limited data we found no evidence of a difference between conservative and operative management in terms of medical complications, mortality, or long term pain.

Benefits

We found one systematic review (search date 1997, 4 RCTs).[11] Only one RCT (106 people) used a fixation device with dynamic features used in contemporary practice (sliding nail plate). Operative treatment was associated with shorter hospital stay, but no data were provided.

Harms

Conservative treatment was associated with leg shortening (conservative 29/39 *v* operative fixation 11/37; RR 2.5, 1.47 to 4.24) and varus deformity (conservative 19/39 *v* operative fixation 3/35; RR 5.7, 1.8 to 17.6).

Comment

Operative treatment was introduced in the 1950s with the expectation of improved functional outcome and reduced incidence of complications of immobilisation and prolonged bed rest. Although we found only limited evidence from RCTs about short term benefits of operation, the additional benefits of early mobilisation and early supported discharge can be realised only after surgery.

Option Arthroplasty versus internal fixation for extracapsular fractures

Summary We found insufficient evidence from RCTs to determine whether replacement arthroplasty has

any advantage over the sliding hip screw for extracapsular hip fractures.

Benefits
We found one systematic review (search date 1996, 1 RCT, 90 people).[12] Participants with unstable extracapsular hip fractures were randomised to arthroplasty or a sliding hip screw. From the limited data available, the two methods of treatment had similar operating times, local wound complications, mortality at 12 months (RR 0.99, 0.47 to 2.10; AR 23.4% for arthroplasty *v* 23.4% for sliding hip screw), and mobility of previously independent patients at discharge (RR 0.80, 0.45 to 1.42; AR 40% *v* 50%).

Harms
More participants in the arthroplasty group required blood transfusion (arthroplasty 34/143 *v* fixation 27/47; RR 1.38, 1.03 to 1.84).

Comment
The RCT had methodological limitation (the method of randomisation was not specified, there was no blinding, analysis was not by intention to treat, and the outcome measures were not defined clearly).[12]

Option Fixed versus dynamic (sliding) extramedullary fixation for extracapsular hip fracture

Summary One systematic review of RCTs has found that sliding hip screws are associated with significantly fewer complications than fixed nail plates in the treatment of extracapsular hip fractures.

Benefits
We found one systematic review (search date 1998).[13] Three RCTs compared a fixed nail plate (Jewett or McLaughlin) against the sliding hip screw. There were no significant differences in mortality or reported pain at follow up.

Harms
The use of fixed nail plates was associated with increased risk of fixation failure (2 trials, 38/62 *v* 12/83 with sliding hip screw; RR 4.27, 2.44 to 7.45). Postoperative mobility was non-significantly poorer in participants whose fractures were fixed with fixed nail plates (1 trial, 15/36 *v* 11/42 with sliding hip screw; RR 1.59, 0.84 to 3.01).

Comment
None.

Option Cephalocondylic nails versus extramedullary fixation for extracapsular hip fracture

Summary One systematic review found that extramedullary fixation of hip fractures using sliding hip screw devices is associated with similar benefits and significantly fewer operative complications than cephalocondylic intramedullary devices.

Benefits
We found one systematic review (search date 1998)[14] and one subsequent RCT.[15] **Intramedullary (Gamma nail) fixation versus extramedullary (sliding hip screw) fixation:** The review identified 14 RCTs (1977 people, follow up 3-12 months). The pooled data showed no evidence of difference between cephalocondylic nails and sliding hip screws in terms of mortality, incidence of wound infection, medical complications of surgery, need for blood transfusion, or functional outcomes at follow up. Radiological screening time, a measure of exposure to radiation, was shorter in the Gamma nail group (Gamma 172 people, sliding hip screw 172 people; WMD −22.6 seconds, −25.7 seconds to −19.5 seconds). **Intramedullary hip screw versus sliding hip screw:** The review identified two trials (231 people). Results for postoperative complications, mortality, and functional outcomes were similar in the two groups. The subsequent RCT (110 people) compared intramedullary hip screw with a sliding hip screw and found no difference between groups in fracture healing or functional outcomes.

Harms
The Gamma nail was associated with an increased risk of fracture of the femur during the operative procedure (RR 3.75, 1.69 to 8.31) or later (RR 6.26, 2.55 to 15.4) and an increased reoperation rate (RR 1.99, 1.27 to 3.11). In the comparisons of intramedullary hip screw and sliding hip screw, more complications of fracture fixation, including all of the intraoperative and later femur fractures, occurred in the intramedullary hip screw group, but the difference was not significant.

Comment
We found no evidence that the theoretical mechanical advantages of intramedullary cephalocondylic devices for operative fixation of extracapsular hip fractures have so far been confirmed. The designs tested have been associated with higher risk of complications of fracture fixation than alternative devices. The data refer to extracapsular hip fractures in the trochanteric region; their relevance to the subtrochanteric fracture subgroup is not known.

Option Condylocephalic nails or extramedullary fixation for extracapsular hip fracture

Summary One systematic review found that condylocephalic nails are less effective than extramedullary fixation for extracapsular hip fractures.

Benefits
We found one systematic review (search date 1997, 11 RCTs, 1667 people).[16] The advantages of condylocephalic nails were a reduced rate of deep wound sepsis (condylocephalic 5/554 *v* extramedullary 23/549; RR 0.26, 0.11 to 0.62), shorter length of surgery (326 people; WMD −22.8 minutes, −27.7 minutes to −17.8 minutes), and lower blood loss during operation (326 people; WMD −208 ml, −262 to −154 ml).

Harms
Use of condylocephalic nails was associated with several adverse outcomes: higher risk of reoperation for fixation failure (8 trials, condylocephalic 118/564 *v* extramedullary 31/566; RR 3.72, 2.54 to 5.44), greater incidence of leg shortening (7 trials, condylocephalic 44/401 *v* extramedullary 19/442; RR 2.71, 1.65 to 4.59), and higher incidence of external rotation deformity (5 trials, condylocephalic 86/345 *v* extramedullary 28/396; RR 3.73, 2.47 to 5.64).

Comment
None.

Question What are the effects of perisurgical medical interventions on surgical outcome and prevention of complications?

Option Temporary traction before surgery for hip fracture

Summary We found no evidence that routine preoperative traction to the injured limb is associated with any significant benefit or harm.

Benefits

We found one systematic review (search date 1998, 4 RCTs, 515 people with recent hip fracture).[6] Traction had no effect on the number of people requiring analgesia in the 24 hours after admission (1 RCT, traction 54/101 *v* control 71/151; RR 1.14, 0.89 to 1.46) or the difficulty of fracture reduction at time of surgery (1 RCT, traction 5/45 *v* control 7/64; RR 1.02, 0.34 to 3.00). In the one trial that compared skeletal traction with skin traction, there was a small but significant reduction in the mean number of analgesic doses used by those treated with skeletal traction (1 RCT, skin traction 40 people, mean 2.50 (SD 1.6) doses *v* skeletal traction 38 people, mean 1.7 (1.4) doses; WMD 0.80, 0.13 to 1.46).

Harms

Two of the trials compared skeletal traction with skin traction. Although no important difference was identified between these two methods, initial skeletal traction was more painful and most costly.

Comment

Routine preoperative traction to the injured limb of hip fracture patients in hospital should be reconsidered.

Option Nerve blocks for pain control before and after hip fracture

Summary One systematic review found that nerve blocks for pain control reduce total intake of analgesic.

Benefits

We found one systematic review (search date 1998, 6 trials (RCT or controlled clinical trial), 229 people with recent hip fracture).[17] One small trial studied the impact of a nerve block at hospital admission, and the remaining five examined perioperative blocks. Use of nerve blocks was associated with a reduced use of other forms of pain management. Evidence for other clinical benefit was limited. Nerve blocks reduced the use of parenteral or oral analgesia to control pain from the fracture or operation or during surgery. Analgesia was required by fewer patients given lateral cutaneous block (2 trials, block 19/26 *v* control 25/25; RR 0.73, 0.58 to 0.92) or triple block (1 trial, block 13/25 *v* control 22/24; RR 0.57, 0.38 to 0.84). It is not clear whether this reduction in use of analgesia was associated with clinical benefit, although the small trial of femoral nerve block on admission reduced the incidence of respiratory infection (block 2/25 *v* control 11/25; RR 0.18, 0.04 to 0.74).

Harms

None reported.

Comment

The trials had few participants, used different types of nerve blocks, and had varying times of insertion. It is unclear whether nerve blocks confer any benefit compared with other methods of analgesia in hip fracture. The possible reduction of respiratory infection is worthy of further study.

Option Perioperative antibiotics

Summary Systematic reviews of RCTs have found that multidose perioperative and single dose preoperative antibiotic prophylaxis is effective in reducing nosocomial infection after hip surgery.

Benefits

Multiple dose perioperative regimens: We found one systematic review (search date 1998, 11 RCTs, 1896 people with recent hip fracture) of multiple dose regimens versus placebo or no prophylaxis.[18] The review found significant reduction in the incidence of deep wound infection (antibiotic 12/961 *v* control 40/935; RR 0.36, 0.21 to 0.65; ARR 2.9%, 1.3% to 4.4%), superficial wound infection (antibiotic 22/705 *v* control 38/661; RR 0.48, 0.28 to 0.81), and urinary tract infection (antibiotic 31/259 *v* control 44/241; RR 0.66, 0.43 to 1.00). The review found no significant reduction in the incidence of respiratory infection (antibiotic 14/259 *v* control 16/241; RR 0.81, 0.41 to 1.63).
Single dose preoperative regimens: We found one systematic review[18] (search date 1998, 6 RCTs, 3276 people with recent hip fracture, including 2195 people from one multicentre trial). Compared with placebo or no treatment, single dose prophylaxis significantly reduced deep wound infection (antibiotic 20/1628 *v* control 49/1648; RR 0.41, 0.25 to 0.69; ARR 1.8%, 0.8% to 2.8%), superficial wound infection (antibiotic 56/1628 *v* control 84/1648; RR 0.68, 0.49 to 0.95), urinary tract infection (antibiotic 127/1376 *v* control 206/1375; RR 0.63, 0.53 to 0.76), and respiratory infection (antibiotic 41/1376 *v* control 91/1375; RR 0.47, 0.33 to 0.66).

Harms

Adverse effects (allergy, rashes, gastrointestinal complaints) were rarely reported but were more common in people given multiple dose perioperative antibiotics (antibiotic 24/520 *v* control 12/362; RR1.83, 0.96 to 3.50).[18]

Comment

Many different antimicrobial agents were studied (all active against *Staphylococcus aureus*). The absolute risk reduction with single dose regimens was not significantly less than with multiple dose regimens.

Option Unfractionated heparin versus low molecular weight heparin

Summary A systematic review of RCTs has found that prophylaxis with unfractionated heparin or low molecular weight heparin after hip fracture significantly reduces the incidence of deep venous thrombosis identified by imaging. We found insufficient evidence to confirm the effect on clinical outcomes (pulmonary thromboembolism or postphlebitic leg).

Benefits

We found one systematic review (search date 1996, 22 RCTs in elderly people undergoing surgery for hip fracture).[19] Overall, quality of trials was poor. **Heparin versus placebo or no treatment:** Ten trials evaluated unfractionated heparin and four trials evaluated low molecular weight heparin. The trials found fewer deep vein thromboses in the lower limb (identified by imaging) with unfractionated heparin (103/407 with heparin *v* 166/409 with control; RR 0.59, 0.49 to 0.72; ARR 0.169; NNT 6) and with low molecular weight heparin (18/104 with heparin *v* 37/110 with control; RR 0.55, 0.34 to 0.88; ARR 0.147; NNT 7). **Unfractionated heparin versus low molecular weight heparin:** Five trials compared the two types of heparin. Low molecular weight heparin significantly reduced deep venous thrombosis identified by imaging (47/252 *v* 64/227 with unfractionated heparin; RR 0.67, 0.48 to 0.94; ARR 0.09, 0.02 to 0.16; NNT 11).

Harms

There was a non-significant increase in overall mortality after hip fracture in the group receiving heparin (heparin 46/420 *v* control 35/423 (8%); RR 1.31, 0.88 to 1.97).[19] One systematic review (search date not stated) summarised the risk of bleeding or transfusion in all RCTs of prophylactic subcutaneous unfractionated heparin in general, orthopaedic, and urological surgery.[20] Overall, excessive bleeding or need for transfusion was significantly increased with heparin (heparin 419/7027 *v* control 244/6504; odds ratio 1.66). Another systematic review (search date 1991) included comparisons of unfractionated heparin and low molecular weight heparin in general and orthopaedic surgery and found insufficient evidence from published RCTs to confirm a difference in the rate of complications due to bleeding.[21]

Comment

We found no trials that reported the incidence of postphlebitic leg or wound complications.

Option Antiplatelet agents

Summary One systematic review has found that aspirin is likely to be effective in reducing the risk of deep venous thrombosis and pulmonary embolism in patients undergoing surgery for hip fracture when it is given as preoperative prophylaxis.

Benefits

We found one systematic review (10 trials reported before March 1990, 898 people) that compared prophylaxis, an antiplatelet agent, and placebo or no prophylaxis after fracture.[22] Most people in the review had a hip fracture. For this group of people, the reduction in incidence of deep venous thrombosis was not significant (antiplatelet 163/454 *v* control 186/444; odds reduction 31%), but for pulmonary embolism the reduction was significant (antiplatelet 14/504 *v* control 34/494, odds reduction 60%).

Harms

The systematic review[22] summarised the bleeding complications reported across all surgical procedures. Fatal bleeds were extremely rare (antiplatelet group 2/4441 *v* controls 0/4450). Transfusion was needed significantly more often in the antiplatelet group (28/2798 *v* controls 15/3808), and other bleeding related complications (reoperation, haematoma, or infection because of a bleed) were more common (antiplatelet agents 177/2269 *v* controls 129/2306).

Comment

A large RCT was published after the search was performed for this review.[23] This trial included 13 356 people having surgery for hip fracture and found that aspirin started preoperatively and continued for 35 days reduces the risk of deep venous thrombosis by about a third compared with placebo. Full analysis will be included in issue 5 of *Clinical Evidence*.

Option Graduated elastic compression (thromboembolism stockings)

Summary We found no randomised trial evaluating thromboembolism stockings in the context of hip fracture in elderly people. One systematic review of RCTs has found that graduated elastic compression in elective total hip replacement reduces the risk of deep venous thrombosis by a third compared with placebo.

Benefits

We found one overview with pooling of data from four trials evaluating the use of graduated elastic compression.[24] Graduated elastic compression significantly reduced deep venous thrombosis in people undergoing elective total hip replacement (stockings 32/125 *v* control 61/111; RR 0.43, 0.30 to 0.61; ARR 0.29; NNT 4).

Harms

The overview found that manufacturers of stockings advise against their use in patients with an ankle:brachial pressure of less than 0.7. Patients with peripheral arterial disease and diabetic people with neuropathy were stated to be particularly at risk of worsening ischaemia, but we found no evidence in RCTs to quantify this risk.

Comment

It is unclear whether extrapolation from hip replacement studies is appropriate for hip fracture patients.

Option Cyclical compression of the foot or calf

Summary The systematic review found that cyclical compression devices (foot or calf pumps) reduce deep venous thrombosis in people with hip fracture. Problems with skin abrasion and compliance have been reported.

Benefits

We found one systematic review (4 trials, 442 people) comparing mechanical pumping devices against no intervention.[19] Cyclical compression devices reduced the risk of deep venous thrombosis (compression 12/202 *v* control 42/212; RR 0.30, 0.17 to 0.53). We found no adequate evidence about any effect on the incidence of pulmonary embolism and overall mortality.

Harms

Problems with skin abrasion and compliance were reported in all four trials of cyclical compression devices.

Comment

None.

Option Beds, mattresses, and cushions for preventing pressure sores

Summary One systematic review found that high specification foam mattresses and pressure relieving mattresses on operating tables prevent pressure sores.

Benefits

We found one systematic review (updated 1999, search date not stated).[25] High specification foam mattresses compared with "standard hospital" foam mattresses significantly reduced the number of patients who developed pressure sores (4 trials, high specification 52/678 *v* standard 57/172; RR 0.29, 0.19 to 0.43). Pressure relieving mattresses for high risk patients in the operating theatre reduced the incidence of postoperative pressure sores. Three RCTs evaluated different methods of pressure relief on the operating table. A viscoelastic polymer (gel) pad compared with a standard table reduced the number of patients who developed postoperative pressure sores (gel 22/205 *v* control 43/211; RR 0.53, 0.33 to 0.85; ARR 0.096; NNT 11). Two RCTs compared an alternating system (applied both during surgery and postoperatively) with a gel pad used during surgery plus standard mattress postoperatively. Use of alternating pressure throughout significantly reduced the number of patients who developedpressure sores (alternation 3/188 *v* control 14/180; RR 0.21, 0.06 to 0.7; ARR 6.2%; NNT 16)

Harms

None identified.

Comment
None.

Option Nutritional supplementation after hip fracture

Summary One systematic review has found that nutritional supplementation (oral protein and energy feeds) reduces unfavourable outcomes after surgery for hip fracture.

Benefits
We found one systematic review (updated October 1999, 15 RCTs, 943 people).[26] Oral multinutrient feeds (providing non-protein energy, protein, some vitamins and minerals), evaluated by six trials, reduced the overall incidence of death or complications by the end of the study (14/66 *v* 26/73; RR 0.52, 0.32 to 0.84), but the study did not find an effect on mortality (12/91 *v* 14/97; RR 0.85, 0.42 to 1.70). Three RCTs comparing nasogastric multinutrient feeding against control found no evidence for an effect on mortality (RR 0.99, 0.50 to 1.97), but the studies were heterogeneous and included people with differing characteristics. Two RCTs found that protein in an oral feed did not reduce mortality significantly (RR 0.94, 0.35 to 2.52), but may have reduced the number of days spent in rehabilitation wards. Two RCTs, one testing intravenous thiamine (vitamin B-1) and other water soluble vitamins, the other testing 1-α-hydroxycholecalciferol, found no evidence of benefit for either vitamin supplement.

Harms
We found little evidence about harms. Nasogastric feeds were sometimes tolerated poorly. Complications, described in only one trial, included bloating and anorexia. We found no reports of diarrhoea or aspiration pneumonia induced by feeding.

Comment
The quality of trials reported in the review was poor. Defects included inadequate size, problems with method (inadequate concealment of allocation, blinding of assessors, and intention to treat analysis), and limited assessment of outcome.

Question What are the effects of rehabilitation programmes and treatment protocols after hip fracture?

Option Inpatient rehabilitation in a geriatric orthopaedic rehabilitation unit

Summary Overall, the evidence from RCTs for effectiveness of geriatric orthopaedic rehabilitation units is inconclusive. Limited evidence from observational studies suggest that these units may reduce the incidence of readmission to an acute facility, improve the rate of return to previous residence, and provide improved function in mobility and activities of daily living.

Benefits
We found one systematic review (search date 1998, 41 comparative studies, including 14 RCTs) that included seven studies (4 RCTs, 3 cohort studies) of geriatric orthopaedic rehabilitation units.[27] **Length of hospital stay:** Results of RCTs showed considerable heterogeneity.[27] The pooled results from RCTs (geriatric orthopaedic rehabilitation units 333 people *v* control 375; WMD 1.6 days, –28.0 days to 31 days) were similar to those found in a cohort study. There was no evidence of a significant difference in total hospital stay between programmes with access to a unit and those without. **Readmission to acute care facility:** The systematic review found a significant reduction in rate of readmission for acute care (units 36/182 *v* control 57/196; RR 0.68, 0.47 to 0.97). **Return to previous residence after discharge:** There was a marginally significant improvement in the return to previous residence in the group treated in geriatric orthopaedic rehabilitation units (4 RCTs, units 254/343 *v* control 255/380; RR 1.11, 1.01 to 1.22). **Death:** The review found no reduction in death by follow up with rehabilitation in a geriatric orthopaedic rehabilitation units (units 79/383 *v* control 90/433; RR 0.98, 0.75 to 1.28). **Hospital morbidity:** Two cohort studies found no significant difference in postoperative complications as a whole (1 study, unit 102 events from 521 admissions *v* control 95 events from 202 admissions). **Mobility and activities of daily living:** One cohort study found that the proportion of participants independently mobile at six months was significantly higher with the orthopaedic unit (units 221/336 *v* control 104/127; RR 1.25, 1.11 to 1.39). Rehabilitation in the geriatric orthopaedic rehabilitation units reduced loss of daily living ability score at 12 months (22/44 in units had loss of ability *v* 28/36 controls; RR 0.64, 0.46 to 0.91). **Health related quality of life:** The systematic review included one RCT (108 people) and one cohort study (723 people) that compared health related quality of life scores for geriatric orthopaedic rehabilitation units versus control. They both found no significant difference.

Harms
Broken pressure sores were more common in geriatric orthopaedic rehabilitation units (1 study, units 17/142 *v* control 8/193, RR 2.89, 1.28 to 6.50).

Comment
None.

Option Geriatric hip fracture programme within an acute orthopaedic unit

Summary The systematic review of randomised and observational studies found limited evidence that geriatric hip fracture programmes compared with control programmes may return more elderly people who have had hip fracture to their previous residence and restore mobility and competence in activities of daily living. Geriatric hip fracture programmes may be effective in reducing length of hospital stay and the incidence of complications arising in hospital. We found no evidence of difference in readmission to an acute facility or in mortality.

Benefits
We found one systematic review (41 comparative studies, including 14 RCTs) that compared five studies of geriatric hip fracture programmes against control.[27] **Length of hospital stay:** The introduction of programmes was associated with a reduction in length of hospital stay in four of the five included studies. The crude average reduction from the published data was nine days. **Readmission for acute care:** One RCT found no significant effect on readmission rate by 4 months. (programme 16/127 *v* control 11/125; RR 1.43, 0.69 to 2.96). **Return to previous residence after discharge:** Geriatric hip fracture programmes reduced the risk of failing to return home (2 RCTs, programmes 121/139 *v* control 100/131; RR 0.88, 078 to 0.99). **Mortality:** Two RCTs found no significant reduction in mortality with a geriatric hip fracture programme (programme 27/165 *v* control 30/158; RR 0.87, 0.54 to

1.39). **Morbidity:** The number of participants sustaining one or more complications in hospital was lower in the group in geriatric hip fracture programmes (programme 162/431 *v* control 39/60; RR 0.58, 0.46 to 0.72). **Mobility and activities of daily living:** One RCT found that programmes were associated with a non-significant reduction in number of people failing to walk independently by discharge (1 RCT, programme 63/127 *v* control 51/125; RR 0.70, 0.43 to 1,15). Another RCT found that performance of a 20 m walk was quicker (1 RCT, programme mean 45 seconds *v* control 59 seconds, no SD provided). A third RCT found that the modified Barthel index was higher in programme participants (1 RCT, programme mean 92.8, 90 to 95.6 *v* control 85.6, 81.3 to 89.8). **Health related quality of life:** The systematic review found no studies of this outcome.

Harms
We found no evidence of harms.

Comment
None.

Option Early supported discharge programmes

Summary One systematic review found that early supported discharge programmes after hip fracture increased the number of people returning to their previous residence and reduced length of hospital stay but increased the number of patients readmitted to hospital.

Benefits
We found one systematic review (41 comparative studies, including 14 RCTs), which included six studies of early supported discharge programmes.[27] **Lengths of hospital stay:** The introduction of early supported discharge programmes was associated with a reduction in length of both acute hospital stay and total number of days in hospital. The crude average reduction (no standard deviations provided) was 6.9 days in acute hospital stay and 2.0 days in total duration of care. **Return to previous residence after discharge:** early supported discharge programmes were associated with a significantly increased rate of return to previous residence (3 cohort studies, programme 203/247 *v* control 129/197; RR 1.25, 1.11 to 1.41). **Mortality:** There was no evidence of benefit or disadvantage from introduction of early supported discharge programmes (1 RCT, programme 12/160 *v* control 6/81; RR 1.01, 0.39 to 2.60). **Morbidity:** One cohort study found no evidence of a significant difference in incidence of one or more hospital complications between early supported discharge programmes and control participants (programme 17/63 *v* control 15/66; RR 1.19, 0.65 to 2.17). **Mobility and activities of daily living:** One cohort study found no evidence of difference in mean score on the mobility dimension of the Nottingham health profile (programme 48 *v* control 50, no SD provided). One RCT found no evidence of difference in improvement of Barthel index over three months (programme 160 people, mean change 1.9 (3.22) *v* control 81 people, mean change 1.7(2.68)). **Health related quality of life:** Two studies reported scores. There was no evidence of difference in mean dimension score on the Nottingham health profile (1 cohort study, 110 people). One RCT found no evidence of difference in EUROQOL score at three months (mean difference –0.04, –0.13 to 0.06).

Harms
Early supported discharge programmes were associated with a significant increase in the incidence of readmission to hospital (3 cohort studies; programme 69/922 *v* control 17/406; RR 1.91, 1.11 to 3.29).

Comment
None.

Option Systematic multicomponent home rehabilitation after hip fracture

Summary One RCT comparing a systematic home based rehabilitation programme with existing services found no important differences.

Benefits
We found no systematic review, but we found one RCT (304 people who had surgery for hip fracture and returned home within 100 days, follow up 12 months) that compared a systematic home based multicomponent rehabilitation strategy addressing physical impairments and activities of daily living against "usual care."[28] The trial found no significant difference between groups in recovery to prefracture levels of self care, home management, social activity, balance, or lower extremity strength. The systematic programme was associated with slightly greater upper arm strength and marginally better gait performance.

Harms
None reported.

Comment
The RCT examined whether systematising home assessment and treatment according to a protocol made a difference in comparison to "usual care." The failure of this trial to find a difference between the systematic programme and usual care may be contextual, indicating that usual care was already being delivered competently.

Competing interests: WG is coordinating editor of the Cochrane Musculoskeletal Injuries Group and has participated in several of the cited systematic reviews.

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Lesson of the week

Tonic seizures are a particular risk factor for drowning in people with epilepsy

Frank M C Besag

It is accepted that people with epilepsy should be supervised when swimming. However, there is little or no guidance about special precautions that should be taken for particular types of seizures. During a tonic seizure the muscles of the chest wall contract and much of the air from the lungs may be expelled. If such a seizure occurs while a person is swimming, the average body density may become higher than the density of the water, causing rapid submersion. When the muscles of the chest wall relax, the person will still be submerged, with the result that water, not air, will enter the respiratory tract and the person will not rise to the surface. We present a case of fatal drowning in a 14 year old boy with epilepsy who had seizures with a marked tonic phase. This case raises an important question with regard to safety: should special precautions be taken to minimise the risk of drowning in patients with tonic seizures?

Case report

A 14 year old boy who had had epilepsy from 7 years of age drowned in a lake on a school outing. His early development was normal. The seizures were all of a similar form: his head and eyes deviated up and to the right; his trunk could either be flexed or straight; he was blue around the mouth; facial twitching was followed by twitching or jerking of the limbs. His parents commented that because he was so rigid it sometimes needed three people to lift him off the floor. He had been treated with sodium valproate and carbamazepine. He stopped taking carbamazepine three months before he died and had had only two seizures during that period. These seizures followed the form already described.

He had always previously been accompanied by his parents when he went swimming. On this occasion he went on an unplanned swim in a lake with 10 or 11 other children and about 15 teachers. He was observed playing happily with the other children, throwing water about. He then disappeared from sight. The teachers did not suspect that he had drowned until the party was about to leave. Divers were called and they found him in about 1.5 m of water. There was a small cut above one eye but no other sign of trauma. His arms were crossed over his chest, as had previously been observed by his parents when he had a tonic seizure. The coroner's verdict was death by drowning secondary to epilepsy.

His parents contacted the British Epilepsy Association and were informed that swimming is good for people with epilepsy and should be encouraged but should be supervised. They asked the question: "What does this mean?"

His parents said, "The supervision should be one-to-one. He should have had someone in water with him. There was no chance for anyone to save him. I think we were blissfully ignorant. I know now he could have had a seizure in the water and I would have been totally unprepared for it. I'm not sure even now that I'd know what to do to resuscitate him. The whole business of epilepsy should be explained properly. You almost need someone to go through it with you." His parents also commented that children with obvious physical disability tend to be better supervised than those who are able, like their son was.

Discussion

Several published papers have acknowledged that drowning is an important cause of death in people with epilepsy.[1–3] Cass et al carried out a population based study of childhood drowning in New South Wales. A total of 132 children aged 0-14 drowned during 1990-5.[4] The researchers confirmed the recommendation that all children with epilepsy should be supervised adequately when swimming. Kemp and Sibert studied the records of 306 children who drowned or nearly drowned in the United Kingdom in 1988-9.[5] Four children with epilepsy had drowned.

Editorial by Forjuoh and Guyer

Tonic seizures pose a high risk of drowning because expulsion of air from the lungs causes rapid submersion

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