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[Intervention Review]

Exercise for acutely hospitalised older medical patients

Peter Hartley[1,2], Jennifer L Keating[3], Kimberley J Jeffs[4,5], Melissa JM Raymond[6,7], Toby O Smith[8]

[1]Department of Physiotherapy, Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK. [2]Department of Public Health and Primary Care, University of Cambridge, Cambridge, UK. [3]Department of Physiotherapy, Monash University, Frankston, Australia. [4]Department of Aged Care, Northern Health, Epping, Australia. [5]Faculty of Medicine, Dentistry and Health Sciences, The University of Melbourne, Parkville, Australia. [6]Physiotherapy Department, Caulfield Hospital, Alfred Health, Melbourne, Australia. [7]College of Science, Health and Engineering, La Trobe University, Melbourne, Australia. [8]Faculty of Medicine and Health Sciences, University of East Anglia, Norwich, UK

Contact: Peter Hartley, ph492@cam.ac.uk.

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ABSTRACT

Background

Approximately 30% of hospitalised older adults experience hospital-associated functional decline. Exercise interventions that promote in-hospital activity may prevent deconditioning and thereby maintain physical function during hospitalisation. This is an update of a Cochrane Review first published in 2007.

Objectives

To evaluate the benefits and harms of exercise interventions for acutely hospitalised older medical inpatients on functional ability, quality of life (QoL), participant global assessment of success and adverse events compared to usual care or a sham-control intervention.

Search methods

We used standard, extensive Cochrane search methods. The latest search date was May 2021.

Selection criteria

We included randomised or quasi-randomised controlled trials evaluating an in-hospital exercise intervention in people aged 65 years or older admitted to hospital with a general medical condition. We excluded people admitted for elective reasons or surgery.

Data collection and analysis

We used standard Cochrane methods. Our major outcomes were 1. independence with activities of daily living; 2. functional mobility; 3. new incidence of delirium during hospitalisation; 4. QoL; 5. number of falls during hospitalisation; 6. medical deterioration during hospitalisation and 7. participant global assessment of success. Our minor outcomes were 8. death during hospitalisation; 9. musculoskeletal injuries during hospitalisation; 10. hospital length of stay; 11. new institutionalisation at hospital discharge; 12. hospital readmission and 13. walking performance. We used GRADE to assess certainty of evidence for each major outcome.

We categorised exercise interventions as: rehabilitation-related activities (interventions designed to increase physical activity or functional recovery, but did not follow a specified exercise protocol); structured exercise (interventions that included an exercise intervention protocol but did not include progressive resistance training); and progressive resistance exercise (interventions that included an element of progressive resistance training).

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Main results

We included 24 studies (nine rehabilitation-related activity interventions, six structured exercise interventions and nine progressive resistance exercise interventions) with 7511 participants. All studies compared exercise interventions to usual care; two studies, in addition to usual care, used sham interventions. Mean ages ranged from 73 to 88 years, and 58% of participants were women.

Several studies were at high risk of bias. The most common domain assessed at high risk of bias was measurement of the outcome, and five studies (21%) were at high risk of bias arising from the randomisation process.

Exercise may have no clinically important effect on independence in activities of daily living at discharge from hospital compared to controls (16 studies, 5174 participants; low-certainty evidence). Five studies used the Barthel Index (scale: 0 to 100, higher scores representing greater independence). Mean scores at discharge in the control groups ranged from 42 to 96 points, and independence in activities of daily living was 1.8 points better (0.43 worse to 4.12 better) with exercise compared to controls. The minimally clinical important difference (MCID) is estimated to be 11 points.

We are uncertain regarding the effect of exercise on functional mobility at discharge from the hospital compared to controls (8 studies, 2369 participants; very low-certainty evidence). Three studies used the Short Physical Performance Battery (SPPB) (scale: 0 to 12, higher scores representing better function) to measure functional mobility. Mean scores at discharge in the control groups ranged from 3.7 to 4.9 points on the SPPB, and the estimated effect of the exercise interventions was 0.78 points better (0.02 worse to 1.57 better). A change of 1 point on the SPPB represents an MCID.

We are uncertain regarding the effect of exercise on the incidence of delirium during hospitalisation compared to controls (7 trials, 2088 participants; very low-certainty evidence). The incidence of delirium during hospitalisation was 88/1091 (81 per 1000) in the control group compared with 70/997 (73 per 1000; range 47 to 114) in the exercise group (RR 0.90, 95% CI 0.58 to 1.41).

Exercise interventions may result in a small clinically unimportant improvement in QoL at discharge from the hospital compared to controls (4 studies, 875 participants; low-certainty evidence). Mean QoL on the EuroQol 5 Dimensions (EQ-5D) visual analogue scale (VAS) (scale: 0 to 100, higher scores representing better QoL) ranged between 48.9 and 64.7 in the control group at discharge from the hospital, and QoL was 6.04 points better (0.9 better to 11.18 better) with exercise. A change of 10 points on the EQ-5D VAS represents an MCID.

No studies measured participant global assessment of success.

Exercise interventions did not affect the risk of falls during hospitalisation (moderate-certainty evidence). The incidence of falls was 31/899 (34 per 1000) in the control group compared with 31/888 (34 per 1000; range 20 to 57) in the exercise group (RR 0.99, 95% CI 0.59 to 1.65).

We are uncertain regarding the effect of exercise on the incidence of medical deterioration during hospitalisation (very low-certainty evidence). The incidence of medical deterioration in the control group was 101/1417 (71 per 1000) compared with 96/1313 (73 per 1000; range 44 to 120) in the exercise group (RR 1.02, 95% CI 0.62 to 1.68).

Subgroup analyses by different intervention categories and by the use of a sham intervention were not meaningfully different from the main analyses.

Authors' conclusions

Exercise may make little difference to independence in activities of daily living or QoL, but probably does not result in more falls in older medical inpatients. We are uncertain about the effect of exercise on functional mobility, incidence of delirium and medical deterioration. Certainty of evidence was limited by risk of bias and inconsistency. Future primary research on the effect of exercise on acute hospitalisation could focus on more consistent and uniform reporting of participant's characteristics including their baseline level of functional ability, as well as exercise dose, intensity and adherence that may provide an insight into the reasons for the observed inconsistencies in findings.

PLAIN LANGUAGE SUMMARY

Exercise for older patients during unplanned hospital stays

Key messages

There may be a benefit in some exercise treatments for older adults during an unplanned hospital stay, but we cannot be certain. Exercise interventions probably do not cause harm; we found no increase in the risk of falling for older adults when they were in hospital.

What is the problem?

Older adults often lose the ability to carry out their usual day-to-day activities following an unplanned hospital admission. One reason for this is that people are less active in hospital than they would normally be at home when well. Being inactive in hospital may also contribute to other problems, such as a greater risk of becoming confused, difficulty moving about and a reduced quality of life when discharged from hospital.

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What did we want to find out?

Does helping older people to exercise whilst in hospital improve their recovery and ability to manage their usual day-to-day activities when they are discharged?

What did we do?

We searched medical databases for studies that compared exercise programmes to usual care (with or without a sham (fake) intervention). Usual care was the treatment that would normally be given to patients who were not part of the research studies. Two studies used sham interventions in addition to usual care. The sham interventions were not designed to impact the patients' recovery, but to add a level of trustworthiness to the research studies.

What did we find?

We found 24 studies with 7511 participants, of whom 58% were women. The average ages of participants in the studies ranged from 73 to 88 years. Thirteen studies were from Europe, six from Oceania, four from North America and one from South America. Participants were admitted to hospital with a wide range of illnesses or medical conditions such as infections, heart failure, kidney failure, bleeding in the stomach or gut, and vertigo.

The types of exercise treatments and the amount of exercise that people were asked to do varied considerably. Nine studies classified the exercise treatment as rehabilitation-related activities (treatments designed to increase physical activity, but that did not follow a specific exercise programme). Six studies consisted of structured exercise (a specific exercise programme that every person in the treatment group performed). The exercise may have varied depending on the individual person's ability, but the treatment did not involve progressive strength training. With progressive strength training people exercise their muscles against some type of resistance that is progressively increased as their strength improves. Nine studies provided an element of progressive resistance training.

Main findings

Exercise programmes may result in little to no difference compared to usual care in people's ability to carry out usual day-to-day activities (scoring 1.8% better, ranging from 0.43% worse to 4.12% better).

Compared to usual care (with or without sham treatments), exercise treatment resulted in 6.5% better (0.2% better to 13.1% better) scores in the ability to walk and move around. However, due to the quality of evidence we are very uncertain as to the true effect of exercise programmes.

Ten per cent fewer people (42% fewer to 41% more) who received exercise programmes compared to those who received usual care experienced new confusion during hospitalisation, but we are uncertain about the results.

No studies measured whether the people who took part in the research thought that the exercise treatment was successful.

Exercise programmes may not clinically improve quality of life at discharge from hospital compared to usual care (6.0% better, ranging from 0.9% better to 15.5% better).

Exercise programmes probably make little difference to the number of people who fall during hospitalisation compared to usual care (1% fewer people, ranging from 41% fewer to 65% more).

Two per cent more people (38% fewer to 68% more) who received exercise programmes became more unwell during hospitalisation compared to those who received usual care. However, due to the quality of evidence, we are very uncertain as to the true effect of exercise programmes.

We remain uncertain if any particular type of exercise provides more benefit than another.

What are the limitations of the evidence?

The quality of evidence was generally low or very low for most of the outcomes that we included in this review. Some studies were designed in a way that reduced the trustworthiness of their results, but there were also important differences between the findings of different studies and much uncertainty as to the true effect of the exercise treatments.

How up to date is the evidence?

This Cochrane Review is current to May 2021.

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Summary of findings 1. Summary of findings table - Exercise interventions compared to usual care with or without sham interventions for acutely hospitalised older medical patients

Exercise interventions compared to usual care with or without sham interventions for acutely hospitalised older medical patients

Patient or population: acutely hospitalised medical patients
Setting: acute hospital wards
Intervention: exercise interventions
Comparison: usual care ± sham interventions

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with usual care ± sham interventions	Risk with exercise interventions				
Functional ability: independence with activities of daily living at discharge from hospital assessed with: Barthel Index (higher scores = greater independence) Scale from: 0 to 100	The mean functional ability: independence with activities of daily living at discharge from hospital ranged from **42 to 96** points on the Barthel Index[a]	MD **1.8 points on the Barthel Index higher** (0.43 lower to 4.12 higher)[b]	-	5174 (16 RCTs)	⊕⊕⊖⊖ Low[c,d]	Exercise interventions may result in little to no difference in independence with activities of daily living at discharge from hospital (SMD 0.09, 95% CI −0.02 to 0.19). A change of 11 points on the Barthel Index is thought to represent a minimally clinically important difference (MCID).
Functional ability: functional mobility at discharge from hospital assessed with: Short Physical Performance Battery (higher scores = greater function) Scale from: 0 to 12	The mean functional ability: functional mobility at discharge from hospital ranged from **3.7 to 4.9** points on the Short Physical Performance Battery [e]	MD **0.78 points on the Short Physical Performance Battery higher** (0.02 lower to 1.57 higher)	-	2369 (8 RCTs)	⊕⊖⊖⊖ Very low[f,g]	The evidence is very uncertain about the effect of exercise on functional mobility at discharge from hospital (SMD 0.28, 95% CI −0.01 to 0.56). A change of 1.0 points on the Short Physical Performance Battery is thought to represent an MCID.
Functional ability: new incidence of delirium during hospitalisation	81 per 1000	**73 per 1000** (47 to 114)	**RR 0.90** (0.58 to 1.41)	2088 (7 RCTs)	⊕⊖⊖⊖ Very low[h,i,j]	The evidence suggests that exercise results in little to no difference in incidence of delirium during hospitalisation.
Quality of life at discharge from hospital	The mean quality of life at discharge from hospital ranged from	MD **6.04 points on the EQ-5D VAS higher**	-	875 (4 RCTs)	⊕⊕⊖⊖ Low[k]	Exercise interventions may result in a small clinically unimportant improvement in quality of life at discharge from

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assessed with: EuroQol 5 Dimensions (EQ-5D) visual analogue scale (VAS) (higher scores = better quality of life) Scale from: 0 to 100	**48.7 to 64.7** points on the EQ-5D VAS	(0.9 higher to 11.18 higher)				hospital. A change of 10 points on the EQ-5D VAS is thought to represent a MCID.
Falls during hospitalisation	34 per 1000	**34 per 1000** (20 to 57)	**RR 0.99** (0.59 to 1.65)	1787 (9 RCTs)	⊕⊕⊕⊖ Moderate[l]	Exercise interventions probably result in little to no difference in falls during hospitalisation.
Medical deterioration during hospitalisation	71 per 1000	**73 per 1000** (44 to 120)	**RR 1.02** (0.62 to 1.68)	2730 (11 RCTs)	⊕⊖⊖⊖ Very low[m,n,o]	Exercise interventions may have no effect on medical deterioration during hospitalisation.
Participant global assessment of success	Not pooled	Not pooled	Not pooled	(0 studies)	-	No studies reported participant global assessment of success.

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the __relative effect__ of the intervention (and its 95% CI).

CI: confidence interval; **MD:** mean difference; **OR:** odds ratio; **RR:** risk ratio

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

See interactive version of this table: https://gdt.gradepro.org/presentations/#/isof/isof_question_revman_web_423027971375700878.

[a] Range based on the seven studies that measured activities of daily living using a Barthel Index (range 0–100).
[b] Standardised mean difference (SMD) was re-expressed as the MD, by multiplying the SMD and associated 95% CIs by the estimated standard deviation (SD) of measurements in the intervention group at discharge. This estimate of the SD was obtained by calculating a weighted mean of measurements taken across all intervention groups of all studies that used the instrument.
[c] Risk of bias: sensitivity analysis removing studies at high risk of bias had no important impact on the effect estimate (SMD 0.18, 95% CI −0.08 to 0.43); however, 11/16 studies judged at high risk of bias. Downgraded one level.
[d] Inconsistency: I^2 = 66%, 95% prediction interval (PI) for the SMD: −0.25 to 0.42, demonstrating significant uncertainty. Downgraded one level.
[e] Range based on the three studies that measured mobility using the Short Physical Performance Battery.
[f] Risk of bias: 6/8 studies assessed at high risk of bias; sensitivity analysis removing studies judged at high risk of bias had an important impact on the effect estimate (SMD 0.53, 95% CI 0.30 to 0.75), as the estimate of effect represented a clinically important difference. Downgraded one level.
[g] Inconsistency: I^2 = 90%, 95% PI for the SMD: −0.52 to 1.07, demonstrating significant uncertainty. Downgraded two levels.

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[h] Risk of bias: 4/8 studies assessed at high risk of bias; sensitivity analysis removing studies judged at high risk of bias had an important impact on the effect estimate (RR 0.86, 95% CI 0.45 to 1.63). Downgraded one level.
[i] Inconsistency: I^2 = 39%, 95% PI for the RR: 0.40 to 2.05 demonstrating significant uncertainty. Downgraded one level.
[j] Imprecision: due to < 200 events, a control event rate of approximately 8% an optimal information size (OIS) is unlikely to have been met (Guyatt and colleagues, 2011). The CI included appreciable benefit and harm (i.e. an RR < 0.75 or > 1.25). Downgraded one level.
[k] Inconsistency: I^2 = 70%, 95% PI for the MD: −3.77 to 15.86, demonstrating significant uncertainty. Downgraded two levels.
[l] Imprecision: due to only 62 events, a control event rate of approximately 2.5% an OIS will not have been met (Guyatt and colleagues, 2011). The CI included appreciable benefit and harm (i.e. an RR < 0.75 or > 1.25). Downgraded one level.
[m] Inconsistency: I^2 = 51%, 95% PI for the RR: 0.33 to 3.19 representing significant uncertainty. Downgraded one level.
[n] Imprecision: < 150 events, a control rate of approximately 7% an OIS is unlikely to have been met. CIs represent appreciable harm and benefit. Downgraded one level.
[o] Indirectness: outcome varies between studies, i.e. combination of studies that report general medical deterioration (e.g. admission to critical care), studies that report new incidence of delirium and studies that report both. Downgraded one level.

Summary of findings 2. Summary of findings table - Rehabilitation-related activity interventions compared to usual care with or without sham interventions for acutely hospitalised older medical patients

Rehabilitation-related activity interventions compared to usual care with or without sham interventions for acutely hospitalised older medical patients

Patient or population: acutely hospitalised older medical patients
Setting: acute hospital wards
Intervention: rehabilitation-related activities
Comparison: usual care ± sham interventions

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with usual care ± sham interventions	Risk with rehabilitation-related activities				
Functional ability: independence with activities of daily living at discharge from hospital assessed with: Barthel Index (higher scores = independence) Scale from: 0 to 100	The mean functional ability: independence with activities of daily living at discharge from hospital was **42** points on the Barthel Index[a]	MD **0 points on the Barthel Index** (0.12 lower to 0.13 higher)[b]	-	2838 (4 RCTs)	⊕⊕⊖⊖ Low[c,d]	Rehabilitation-related activities may result in little to no difference in independence with activities of daily living at discharge from hospital (standardised mean difference (SMD) 0.00, 95% CI −0.12 to 0.13). A change of 11 points on the Barthel Index is thought to represent a minimally clinically important difference (MCID).
Functional ability: functional mobility at discharge from hospital assessed with: Physical Performance and Mobil-	The mean functional ability: functional mobility at discharge from hospital was **5** points on	MD **0.14 points on the Physical Performance and Mobility**	-	975 (1 study)	-	Included only 1 study categorised as delivering a rehabilitation-related activity intervention. The effect of rehabilitation-related activities on functional mobility at discharge from hospital was very uncertain.

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ity Examination (higher scores = greater function)	the Physical Performance and Mobility Examination	**Examination higher** (0.01 higher to 0.27 higher)				
Incidence of new delirium during hospitalisation	107 per 1000	**92 per 1000** (32 to 267)	**RR 0.86** (0.30 to 2.50)	732 (2 RCTs)	⊕⊖⊖⊖ Very low[e,f,g]	The evidence was very uncertain with regard to the effect of rehabilitation-related activity interventions on incidence of delirium during hospitalisation.
Falls during hospitalisation	24 per 1000	**32 per 1000** (7 to 140)	**RR 1.33** (0.30 to 5.84)	250 (1 study)	-	Only 1 study categorised as delivering a rehabilitation-related activity intervention was included. The effect of rehabilitation-related activities on falls during hospitalisation was very uncertain.
Quality of life at discharge from hospital assessed with: EuroQol 5 Dimensions (EQ-5D) visual analogue scale (VAS) (higher scores = better quality of life) Scale from: 0 to 100	The mean quality of life at discharge from hospital was **48.9** points on the EQ-5D VAS	MD **2.2 points on the EQ-5D VAS higher** (1.9 lower to 6.3 higher)	-	350 (1 study)	-	Only 1 study reported a quality-of-life outcome at hospital discharge. The effect of rehabilitation-related activities on the incidence of delirium during hospitalisation was very uncertain.
Medical deterioration during hospitalisation	107 per 1000	**92 per 1000** (32 to 267)	**RR 0.86** (0.30 to 2.50)	732 (2 RCTs)	⊕⊖⊖⊖ Very low[h,i,j]	The evidence was very uncertain with regard to the effect of rehabilitation-related activity interventions on incidence of medical deterioration during hospitalisation.
Participant global assessment of success	Not pooled	Not pooled	Not pooled	(0 studies)	-	No studies reported participant global assessment of success.

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: confidence interval; **MD:** mean difference; **OR:** odds ratio; **RR:** risk ratio

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

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See interactive version of this table: https://gdt.gradepro.org/presentations/#/isof/isof_question_revman_web_423062461138566957.

[a] Based on the one study that measured activities of daily living using a Barthel Index (range of possible scores 0–100).
[b] SMD was re-expressed as the MD, by multiplying the SMD and associated 95% CIs by the estimated standard deviation (SD) of measurements in the intervention group at discharge. This estimate of the SD was obtained by calculating a weighted mean of measurements taken across all intervention groups of all studies that used the instrument.
[c] Risk of bias: 3/4 studies were at high risk of bias. Downgraded one level.
[d] Inconsistency: I^2 = 40%, 95% prediction interval (PI) for the SMD: −0.11 to 0.22 demonstrating significant uncertainty. Downgraded one level.
[e] Risk of bias: 1/2 studies were at high risk of bias. Downgraded one level.
[f] Inconsistency: I^2 = 63%, 95% PI for the RR: 0.17 to 4.40, demonstrating significant uncertainty. Downgraded one level.
[g] Imprecision: due to only 67 events, a control event rate of approximately 11% an optimal information size (OIS) is unlikely to have been met (Guyatt and colleagues, 2011). The CIs included no effect, appreciable benefit and appreciable harm (i.e. an RR < 0.75 and > 1.25). Downgraded one level.
[h] Risk of bias: 1/2 studies were at high risk of bias. Downgraded one level.
[i] Inconsistency: I^2 = 63%, 95% PI for the RR: 0.17 to 4.40, demonstrating significant uncertainty. Downgraded one level.
[j] Imprecision: due to only 67 events, a control event rate of approximately 11% an OIS is unlikely to have been met (Guyatt and colleagues, 2011). The CIs included no effect, appreciable benefit and appreciable harm (i.e. an RR < 0.75 and > 1.25). Downgraded one level.

Summary of findings 3. Summary of findings table - Structured exercise interventions compared to usual care with or without sham interventions for acutely hospitalised older medical patients

Structured exercise interventions compared to usual care with or without sham interventions for acutely hospitalised older medical patients

Patient or population: acutely hospitalised older medical patients
Setting: acute hospital wards
Intervention: structured exercise interventions
Comparison: usual care ± sham interventions

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with usual care ± sham interventions	Risk with structured exercise interventions				
Functional ability: independence with activities of daily living at discharge from hospital assessed with: Barthel Index (higher scores = greater independence) Scale from: 0 to 100	The mean functional ability: independence with activities of daily living at discharge from hospital ranged from **55 to 56** points on the Barthel Index[a]	MD **2.6 points on the Barthel Index higher** (4.45 lower to 9.64 higher)[b]	-	648 (5 RCTs)	⊕⊕⊖⊖ Low[c,d]	Structured exercise may result in little to no difference in independence with activities of daily living at discharge from hospital (standardised mean difference (SMD) 0.12, 95% CI −0.21 to 0.45). A change of 11 points on the Barthel Index is thought to represent a minimally clinically important difference (MCID).

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Functional ability: functional mobility at discharge from hospital assessed with: Elderly Mobility Scale (higher scores = greater function) Scale from: 0 to 20	The mean functional ability: functional mobility at discharge from hospital was **14.13** units on the Elderly Mobility Scale[e]	MD **1.79 units on the Elderly Mobility Scale higher** (3.44 lower to 7.02 higher)[b]	-	416 (2 RCTs)	⊕⊖⊖⊖ Very low[f,g,h]	The evidence was very uncertain with regard to the effect of structured exercise programmes on functional mobility at discharge from hospital (SMD 0.30 95% CI, -0.96, 1.57). A change of 2 points on the Elderly Mobility Scale is thought to represent an MCID.
Functional ability: new incidence of delirium during hospitalisation	Only 1 study reported the outcome. The study found only 1 incidence of delirium in the intervention group and 0 in the control group.			100 (1 study)	-	Included only 1 study categorised as delivering a structured exercise intervention. The effect of structured exercise on the incidence of new delirium during hospitalisation was very uncertain.
Quality of life at discharge from hospital assessed with: EuroQol 5 Dimensions (EQ-5D) visual analogue scale (VAS) (higher scores = better quality of life) Scale from: 0 to 100	The mean quality of life at discharge from hospital was **64.74** points on the EQ-5D VAS	MD **3.74 points on the EQ-5D VAS higher** (6.32 lower to 13.8 higher)	-	76 (1 study)	-	Only 1 study reported a quality-of-life outcome at hospital discharge. The effect of structured exercise interventions on quality of life at discharge from hospital was very uncertain.
Falls during hospitalisation	40 per 1000	**31 per 1000** (9 to 102)	**RR 0.76** (0.23 to 2.53)	542 (3 RCTs)	⊕⊕⊖⊖ Low[i]	Structured exercise interventions may result in little to no difference in falls during hospitalisation.
Medical deterioration during hospitalisation	20 per 1000	**51 per 1000** (10 to 271)	**RR 2.56** (0.48 to 13.54)	200 (2 RCTs)	⊕⊖⊖⊖ Very low[j,k]	The evidence was very uncertain with regard to the effect of structured exercise programmes on medical deterioration during hospitalisation.
Participant global assessment of success	Not pooled	Not pooled	Not pooled	(0 studies)	-	No studies reported participant global assessment of success.

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the __relative effect__ of the intervention (and its 95% CI).

CI: confidence interval; **MD:** mean difference; **OR:** odds ratio; **RR:** risk ratio

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

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Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

See interactive version of this table: https://gdt.gradepro.org/presentations/#/isof/isof_question_revman_web_423064120727928815.

[a] Range based on the two studies that measured activities of daily living using a Barthel Index (range of possible scores 0–100).
[b] Standardised mean difference (SMD) was re-expressed as the MD, by multiplying the SMD and associated 95% CIs by the estimated standard deviation (SD) of measurements in the intervention group at discharge. This estimate of the SD was obtained by calculating a weighted mean of measurements taken across all intervention groups of all studies that used the instrument.
[c] Risk of bias: 4/5 were assessed at high risk of bias, sensitivity analysis not possible. Downgraded one level.
[d] Inconsistency: I^2 = 71%, 95% prediction interval (PI) for the SMD: 0.57 to 0.582 demonstrating uncertainty as upper CI represented meaningful effect. Downgraded one level.
[e] Mean based on the one study that measured functional mobility using the Elderly Mobility Scale.
[f] Risk of bias: 2/2 studies were at high risk of bias due to lack of assessor blinding. Downgraded one level.
[g] Inconsistency: I^2 = 93%, 95% PI for the SMD: −1.54 to 2.32, demonstrating significant uncertainty. Downgraded one level.
[h] Imprecision: the 95% CIs for the estimate of the effect overlapped 0 and represented both appreciable benefit and harm. The optimal information size (OIS) was sufficient, based on an MCID of 2 points on the Short Physical Performance Battery and SD of 2.8 (pooled SD from main analyses) corresponding to a sample size of 32 per arm. Downgraded one level.
[i] Imprecision: due to only 20 events, a control event rate of approximately 2.5% an OIS was not met (Guyatt and colleagues, 2011). The CIs included no effect and appreciable benefit and harm (i.e. an RR < 0.75 or > 1.25). Downgraded two levels for imprecision due to < 50 events.
[j] Indirectness: outcome varied between studies, one study reported incidence of delirium and incidence of admission to critical care, the other study only reported incidence of admissions to critical care. Downgraded one level.
[k] Imprecision: due to only 10 events, a control event rate of approximately 2% an OIS was not met (Guyatt and colleagues, 2011), due to the very small number of events (< 50). Downgraded two levels.

Summary of findings 4. Summary of findings table - Progressive resistance exercise interventions compared to usual care with or without sham interventions for acutely hospitalised older medical patients

Progressive resistance exercise interventions compared to usual care with or without sham interventions for acutely hospitalised older medical patients

Patient or population: acutely hospitalised older medical patients
Setting: acute hospital wards
Intervention: progressive resistance exercise
Comparison: usual care ± sham interventions

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with usual care ± sham interventions	Risk with progressive resistance exercise				

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Functional ability: independence with activities of daily living at discharge from hospital assessed with: Barthel Index (higher scores = greater independence) Scale from: 0 to 100	The mean functional ability: independence with activities of daily living at discharge from hospital ranged from **75 to 96** points on the Barthel Index[a]	MD **0.14 points on the Barthel Index higher** (0.05 lower to 0.32 higher)[b]	-	1688 (7 RCTs)	⊕⊕⊖⊖ Low[c,d]	The evidence is classified as very uncertain with regard to the effect of progressive resistance exercise on independence with activities of daily living at discharge from hospital (SMD 0.14, 95% CI −0.05 to 0.32). A change of 11 points on the Barthel Index is thought to represent a minimally clinically important difference (MCID).
Functional ability: functional mobility at discharge from hospital assessed with: Short Physical Performance Battery (higher scores = greater function) Scale from: 0 to 12	The mean functional ability: functional mobility at discharge from hospital ranged from **3.7 to 4.9** points on the Short Physical Performance Battery [e]	MD **0.24 points on the Short Physical Performance Battery higher** (0.09 lower to 0.56 higher)[b]	-	978 (5 RCTs)	⊕⊖⊖⊖ Very low[f,g]	The evidence is classified as very uncertain with regard to the effect of progressive resistance exercise on functional mobility at discharge from hospital. (SMD 0.63, 95% CI-0.28, 1.55). A change of 1.0 points on the Short Physical Performance Battery is thought to represent a MCID.
Functional ability: new incidence of delirium during hospitalisation	71 per 1000	**68 per 1000** (39 to 119)	**RR 0.96** (0.55 to 1.68)	1256 (4 RCTs)	⊕⊕⊖⊖ Low[h,i]	The evidence is classified as very uncertain with regard to the effect of progressive resistance exercise on incidence of delirium during hospitalisation.
Quality of life at discharge from hospital assessed with: EuroQol 5 Dimensions (EQ-5D) visual analogue scale (VAS) (higher scores = better quality of life) Scale from: 0 to 100	The mean quality of life at discharge from hospital ranged from **57.5 to 62.4** points on the EQ-5D VAS	MD **8.9 points on the EQ-5D VAS higher** (2.35 higher to 15.45 higher)	-	449 (2 RCTs)	⊕⊕⊕⊖ Moderate[j]	Progressive resistance exercise probably increases quality of life at discharge from hospital slightly. A change of 10 points on the EQ-5D VAS is thought to represent a MCID.
Falls during hospitalisation	34 per 1000	**33 per 1000** (16 to 65)	**RR 0.96** (0.48 to 1.91)	995 (5 RCTs)	⊕⊕⊖⊖ Low[k]	Progressive resistance exercise may result in little to no difference in falls during hospitalisation.
Medical deterioration during hospitalisation	62 per 1000	**61 per 1000** (32 to 115)	**RR 0.99** (0.52 to 1.87)	1798 (7 RCTs)	⊕⊖⊖⊖ Very low[l,m,n]	The evidence is classified as very uncertain with regard to the effect of progressive resistance exercise on medical deterioration during hospitalisation.
Participant global assessment of success	Not pooled	Not pooled	Not pooled	(0 studies)	-	This outcome was not measured by any of the included studies.

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*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: confidence interval; **MD:** mean difference; **OR:** odds ratio; **RR:** risk ratio

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

See interactive version of this table: https://gdt.gradepro.org/presentations/#/isof/isof_question_revman_web_423057317911555615.

[a] Range based on the four studies that measured activities of daily living using a Barthel Index (range of possible scores 0–100).
[b] Standardised mean differences (SMD) was re-expressed as the MD, by multiplying the SMD and associated 95% CIs by the estimated standard deviation (SD) of measurements in the intervention group at discharge. This estimate of the SD was obtained by calculating a weighted mean of measurements taken across all intervention groups of all studies that used the instrument.
[c] Risk of bias: 4/7 are classified as high risk of bias. Sensitivity analysis removing studies at high risk of bias provides a larger effect size estimate in favour of progressive resistance exercise (SMD 0.25, 95% CI −0.12 to 0.61). Downgraded one level.
[d] Inconsistency: I^2 = 68%, 95% prediction interval (PI) for the SMD: −0.29 to 0.57, demonstrating significant uncertainty. Downgraded one level.
[e] Range based on the three studies that measured mobility using the Short Physical Performance Battery.
[f] Risk of bias: 3/5 are classified as high risk of bias. Sensitivity analysis removing studies at high risk of bias provides a larger effect size estimate in favour of progressive resistance exercise (SMD 0.53, 95% CI 0.30 to 0.75). Downgraded one level.
[g] Inconsistency: I^2 = 84%, 95% PI for SMD: −0.50 to 0.98, demonstrating significant uncertainty. Downgraded two levels.
[h] Inconsistency: I^2 = 37%, 95% PI for the RR: 0.45 to 2.29 demonstrating significant uncertainty. Downgraded one level.
[i] Imprecision: due to only 90 events, a control event rate of approximately 10% an optimal information size (OIS) is unlikely to have been met (Guyatt and colleagues, 2011). The CI includes appreciable benefit and harm (i.e. an RR < 0.75 or > 1.25). Downgraded one level.
[j] Inconsistency: I^2 = 67%, PI of the mean difference: −1.14 to 18.94 demonstrating significant uncertainty regarding the size of the effect. Downgraded one level.
[k] Imprecision: due to only 35 events, a control event rate of approximately 6% an OIS has not been met (Guyatt and colleagues, 2011), due to the very small number of events (< 50). Downgraded two levels.
[l] Inconsistency: I^2 = 48%, 95% PI of the RR: 0.29 to 3.34 demonstrating significant uncertainty. Downgraded one level.
[m] Indirectness: outcome varies between studies, i.e. combination of studies that report general medical deterioration (e.g. admission to critical care), studies that report new incidence of delirium and studies that report both. Downgraded one level.
[n] Imprecision: due to only 121 events, a control event rate of approximately 6% an OIS is unlikely to have been met (Guyatt and colleagues, 2011). The CI for the RR includes no effect and appreciable benefit and harm (i.e. an RR < 0.75 or > 1.25). Downgraded one level.

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BACKGROUND

Description of the condition

Older adults often experience a reduction in functional ability during acute illness or hospitalisation (Clegg 2013). The degree of loss of function is thought to be dependent on pre-existing physical and cognitive frailty and the severity of the illness (Covinsky 2011; Lafont 2011). It is suggested that for people admitted to hospital, hospital care itself may impede functional recovery or even lead to further loss of function (Lafont 2011; Sourdet 2015; Zisberg 2015). Terms such as hospital-associated functional decline (Zisberg 2015) and hospital-associated deconditioning (Kortebein 2009) have been used to refer to this phenomenon.

Approximately 30% of hospitalised older adults experience hospital-associated functional decline (Loyd 2020), defined as an increased dependence in activities of daily living (ADL) (Loyd 2020). However, many also experience a reduction in functional mobility (Lyons 2019), cognition (Cole 2015; McCusker 2001), and quality of life (Davydow 2013). Furthermore, hospital-associated functional decline is associated with length of hospital stay (Zisberg 2015), new-institutionalisation (Fortinsky 1999; Lyons 2019), readmission (Hoyer 2014; Tonkikh 2016), progressive disability and mortality (Gill 2015).

Description of the intervention

The World Health Organization (WHO) have defined exercise as "a subcategory of physical activity that is planned, structured, repetitive, and purposive, in the sense that the improvement or maintenance of one or more components of physical fitness is the objective. The terms 'exercise' and 'exercise training' are frequently used interchangeably and generally refer to physical activity performed during leisure time with the primary purpose of improving or maintaining physical fitness, physical performance, or health" (WHO 2020).

For pragmatic reasons, this review has adopted a broader definition of exercise to include the interventions that fit the WHO definition, plus those that describe rehabilitation-related activities. We defined these as interventions designed to increase physical activity or functional recovery but without explicit description of an exercise protocol. In keeping with the original review (de Morton 2007a), this definition included studies with any of the following in their description of the intervention.

- An environment (e.g. hospital ward) with one or more dedicated physiotherapists or occupational therapists that was compared to a control environment with no access to therapists or access was via referral only.
- An environment with nursing staff trained to focus on functional assessment and management of their patients that was compared to a control environment where nurses did not receive such training.
- An environment with a model of care based on a previous publication describing either of the above, that was compared to a control environment with no such modifications.

In addition to the subgroup defined as 'rehabilitation-related activities', we included two further subgroups, 'structured exercise interventions' and 'progressive resistance exercise interventions'. Structured exercise interventions were defined as interventions such as walking programmes that included an exercise protocol but did not include progressive resistance training. Progressive resistance exercises were defined as interventions that included an exercise intervention protocol with a progressive resistance training component.

How the intervention might work

A suggested mechanism of hospital-associated functional decline is loss of muscle strength or 'acute sarcopenia' due to inactivity and bed rest (Hartley 2021; Kortebein 2008; Zisberg 2015). Therefore, exercise interventions that promote in-hospital activity may prevent deconditioning and thereby maintain physical function during hospitalisation.

Given the multifactorial nature of acute sarcopenia (Welch 2018), it may be the case that more-specific exercise such as progressive strength training is required to counter the negative effects of acute hospitalisation (Falvey 2015). Progressive resistance strength training is an effective intervention for improving physical functioning in older people (Liu 2009). For this reason, our defined subgroups of interventions differentiated between exercise interventions with and without progressive resistance training components. There is also evidence that exercise interventions may improve cognitive function in older adults (Heyn 2004), and may have an effect in the prevention of delirium (Inouye 2003).

Why it is important to do this review

This review was last published in 2007. Over the past 14 years, several important papers have been published on this topic. New research is available that justifies the update of this systematic review.

The original review reported inconclusive evidence to support exercise for acutely hospitalised older adults to improve functional outcomes (de Morton 2007). However, it also reported 'silver' level evidence that multidisciplinary interventions that include exercise may increase the proportion of patients discharged to home and reduce length and cost of hospital stay.

Given the significant clinical implications that hospital-associated functional decline has for both patients and health services, updating this review will provide evidence to drive decision-making regarding systems of hospital care for older adults.

OBJECTIVES

1. To evaluate the benefits and harms of exercise interventions for acutely hospitalised older medical inpatients on functional ability, quality of life (QoL), participant global assessment of success and adverse events compared to usual care or a sham-control intervention.

2. To determine the effect of exercise interventions for acutely hospitalised older medical inpatients on walking performance and hospital outcomes including length of hospital stay, new institutionalisations and hospital readmissions.

3. To determine if the type of exercise (rehabilitation-related activities, structured exercise or progressive resistance exercise) showed differences in benefit in any of the outcomes.

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METHODS

Criteria for considering studies for this review

Types of studies

We included prospective randomised controlled trials (RCT) or quasi-randomised controlled clinical trials (QRCT) (e.g. alternate allocation, date of birth, medical record number) comparing exercise for medical inpatients to usual care or a sham intervention.

Types of participants

We included studies if participants were aged 65 years or older, admitted to a hospital medical or geriatric ward, or admitted to hospital with an acute medical condition. This review excluded people admitted to inpatient rehabilitation hospitals or intensive care units. Trials were only included if 95% of the study participants were aged at least 65 years and were randomly allocated to study group within three days of hospital admission. We excluded studies of people exclusively experiencing cerebrovascular accidents or a non-general medical condition (e.g. a respiratory-specific condition such as an exacerbation of chronic obstructive pulmonary disorder) and animal studies.

Types of interventions

We considered any trial that investigated the effects of either exercise interventions or exercise prescribed as a component of a multidisciplinary intervention for inclusion. We defined exercise as any physical activity intervention programme designed to maintain or improve participant strength or function.

Comparator interventions were either 'usual care' (i.e. no change in hospital care, which might include physiotherapy) or a sham-control intervention (i.e. an intervention that was not expected to affect physical or cognitive functioning, such as relaxation exercises, breathing exercises, gentle stretches). In the main analyses, we did not plan separate analyses for studies that used sham interventions, but combined these studies with those that compared an exercise intervention to usual care alone. This decision was made based on the original review (de Morton 2007a), and our knowledge of subsequently published studies. We expected significant variation across the three decades of included studies, across the different healthcare systems and countries, and between different types of ward (e.g. geriatric versus medical wards) in what constituted usual care. Due to the lack of standardisation in usual care, we did not think that a sham intervention would represent greater interstudy variability than already existed.

As described in the Background, we classified interventions in one of the following subgroups: rehabilitation-related activities, structured exercise interventions and progressive resistance exercise interventions. These subgroups were defined a priori, based on our knowledge from the original review (de Morton 2007a), and our knowledge of subsequently published papers.

Types of outcome measures

Major outcomes

- Functional ability, which was subcategorised into three groups (if more than one measure was provided within the subcategories, we preferentially extracted the measure most frequently reported among the other included studies):
  - independence with activities of daily living (ADL) (including but not limited to the Barthel Index and Functional Independence Measure);
  - functional mobility (including but not limited to: Elderly Mobility Scale, de Morton Mobility Index, Hierarchical Assessment of Balance and Mobility, Functional Ambulatory Category);
  - new incidence of delirium during hospitalisation.
- Quality of life.
- Number of falls during hospitalisation.
- Medical deterioration during hospitalisation (defined as any medical deterioration described in the study report including development of delirium, but excluding death).
- Participant global assessment of success.

Minor outcomes

- Death during hospitalisation.
- Musculoskeletal injuries during hospitalisation.
- Hospital length of stay.
- New institutionalisation at hospital discharge.
- Hospital readmission.
- Walking performance (including but not limited to the Timed Up and Go test and the 10 m or 6 m walk test).

Timing of outcome assessments

Discharge from hospital was the time point for between-group comparisons of all major outcomes.

The time point for between-group comparisons of all minor outcomes was discharge from hospital, apart from readmission to hospital which, in order to reduce loss to follow-up, was taken as the first data collection time point after discharge reported by the individual studies.

Search methods for identification of studies

Electronic searches

We adapted the original search strategy to improve identification of relevant studies (de Morton 2007a). Therefore, the search was not limited to the time after the original review, but from inception of each database. We searched the following databases from inception to May 2021.

- Cochrane Central Register of Controlled Trials (CENTRAL; Appendix 1).
- MEDLINE via Ovid (Appendix 2).
- Embase via Ovid (Appendix 3).

We also searched the following databases registries for ongoing and recently completed studies (May 2021).

- ClinicalTrials.gov (clinicaltrials.gov; Appendix 4).
- WHO Clinical Trials Registry Platform (trialsearch.who.int/Default.aspx;Appendix 5).

Searching other resources

We searched all reference lists of included studies for other potentially relevant studies missed by the electronic search of databases.

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Data collection and analysis

Selection of studies

Two review authors (PH and MR or KJ or JK or TS) independently examined all titles and abstracts by using the predefined eligibility criteria. If a reason for exclusion was not evident, we obtained the full manuscript. Two review authors (PH and MR or KJ or JK or TS) independently examined the full manuscripts of all remaining studies. We resolved disagreement by discussion other review authors (MR, KJ, JK, TS). All review authors agreed on the final list of included studies. We used Covidence to manage the screening and storage of studies.

Data extraction and management

Two review authors (PH and MR or KJ or JK or TS) independently extracted relevant data for each included study including study location, population description, outcome measures used, participant and hospital outcome data, and details of the intervention based on the TIDieR checklist (Hoffmann 2014):

- intervention name;
- rationale, theory or goal of the elements essential to the intervention;
- description of any materials used in the intervention;
- description of the procedures and activities used in the intervention;
- description of who provided the intervention, including expertise and specific training;
- description of modes of delivery (e.g. one-to-one or group sessions);
- description of where the intervention occurred;
- description of the dose of the intervention (frequency, duration, intensity);
- description of how the intervention was personalised, titrated or adapted;
- description of any modifications made to the intervention during the course of the study;
- description of how fidelity to the intervention was assessed;
- description of the observed fidelity.

We resolved disagreements by discussion with other review authors (MR, KJ, JK, TS). We contacted trial authors for additional information regarding the outcome data if required.

Main comparison

The main comparison was exercise intervention versus usual care or a sham-control intervention. The subgroup comparisons were:

- rehabilitation-related activities versus usual care or a sham-control intervention;
- structured exercise versus usual care or a sham-control intervention;
- progressive resistance training versus usual care or a sham-control intervention.

We used Covidence to manage the extracted data.

Assessment of risk of bias in included studies

Two review authors (PH and MR or KJ or JK or TS) independently assessed risk of bias using the Cochrane RoB 2 tool (Higgins 2022a). We assessed risk of bias for all outcomes included in the review at the time points included in the meta-analyses (i.e. at hospital discharge for all outcomes apart from readmission to hospital which was taken as the first data collection time point after discharge reported by the individual studies). We resolved disagreements through discussion with other review authors (MR, KJ, JK, TS), and approached the Cochrane Central Executive Methods Team for guidance. The RoB 2 tool covers the following domains:

- bias arising from the randomisation process;
- bias due to deviations from intended interventions;
- bias due to missing outcome data;
- bias in measurement of the outcome;
- bias in selection of the reported result.

Risk of bias assessments are outcome specific for all domains other than bias arising from the randomisation process, which is study specific. For both outcome-specific and study-specific assessments, the possible risk of bias judgements are: low risk of bias; some concerns and high risk of bias. We made overall judgements of risk of bias using the published signalling questions and algorithms. We assessed risk of bias based on the effect of assignment to the intervention as opposed to the effect of adherence to the intervention. We used Covidence to manage the risk of bias assessment using a customised risk of bias set up.

Two review authors (JK, KJ) conducted included studies. They were not involved in the risk of bias assessments of their studies.

Measures of treatment effect

For dichotomised data (e.g. the number of participants experiencing an adverse event), we calculated the risk ratio (RR) and associated 95% confidence intervals (CIs).

For continuous data, we calculated the standardised mean difference (SMD) or the mean difference (MD) and associated 95% CIs. We used the MD when outcome measures in pooled trials were measured using the same scale. We used the SMD when studies used different instruments to assess comparable factors. We re-expressed the SMD as the MD of a common instrument for interpretation, by multiplying the SMD and associated CIs by the (estimated) standard deviation (SD) of measurements of the intervention groups at discharge (postintervention). We obtained this estimate of the SD by calculating a weighted mean of measurements taken across all intervention groups of all studies that used the instrument (Higgins 2022b).

Unit of analysis issues

Where a trial reported multiple arms, we included only the relevant arms. If two comparisons were combined in the same meta-analysis, we halved the control group to avoid double-counting. One trial contained three arms consisting of a control group and two groups that were given exercise programmes; one of the two had the exercises supervised by a researcher and the other received daily reminders to exercise but no supervision (Hu 2020). To avoid the dilution of treatment effect caused by the absence of

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supervision, the intervention group that did not receive supervision was omitted from analysis.

We listed all treatment arms in the Characteristics of included studies table, even if they are not used in the review.

Dealing with missing data

We attempted to contact study authors if any data were missing or unclear. This included details of participant numbers, interventions, and outcome data.

We imputed certain missing data if they were unobtainable. Where studies reported only medians, we used these as direct best estimates of the group mean. We converted associated interquartile ranges (IQRs) to best estimates of the SDs by dividing the IQR by 1.35 (Higgins 2022b).

We derived SDs from related statistics (standard errors, CIs, t statistics and P values) when necessary using methods described in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2022b). We conducted sensitivity analyses by reanalysing after removing all imputed data.

Assessment of heterogeneity

We assessed clinical and methodological diversity in terms of participants, interventions, outcomes and study characteristics for the included studies to determine whether a meta-analysis was appropriate using the data from the Characteristics of included studies table.

We used the I^2 statistic to quantify inconsistency amongst the trials in each analysis and planned to use the following guide for the interpretation of an I^2 value (Deeks 2022):

- 0% to 40% might not be important;
- 30% to 60% may represent moderate heterogeneity;
- 50% to 90% may represent substantial heterogeneity;
- 75% to 100% represents considerable heterogeneity.

We considered that the observed value of the I^2 statistic depends on: magnitude and direction of effects, and strength of evidence for heterogeneity (e.g. P value from the Chi^2 test, or a CI for the I^2 statistic: uncertainty in the value of the I^2 statistic is substantial when the number of studies is small).

We interpreted the Chi^2 test with $P \leq 0.10$ indicating evidence of statistical heterogeneity.

We assessed heterogeneity by calculating the I^2 statistic and prediction intervals (PIs) (Deeks 2022). We calculated PIs using R software (R), and the metafor package (Viechtbauer 2010).

Assessment of reporting biases

We assessed reporting bias for the major outcomes by comparison between the planned analysis reported for each the individual studies and the available results, and by visual examination of contour-enhanced funnel plots when a meta-analysis included at least 10 studies (Page 2022).

For all included studies, we attempted to obtain the protocol or the trial's registry record, or both. We compared these and the statistical analysis plan to the available results.

Contour-enhanced funnel plots were produced with R (R) using the metafor package (Viechtbauer 2010). The funnel plots were visually assessed for asymmetry.

Data synthesis

We conducted pair-wise meta-analyses using Review Manager Web (Review Manager Web).

Based on the original review (de Morton 2007a), we concluded that methodological and clinical variation precluded the assumption of fixed-effect models, that is that all effect estimates are estimating the same underlying treatment effect (Deeks 2022). Therefore, meta-analyses using random effects models was conducted. If insufficient data were available to include a study in a meta-analysis, or if fewer than two studies measured the outcome of interest, a narrative summary of the intervention effect was reported.

Primary meta-analyses included all studies with the relevant outcomes regardless of risk of bias scoring.

Subgroup analysis and investigation of heterogeneity

We conducted the following subgroup analyses to examine heterogeneity based on the type of exercise intervention. Subgroups are defined in the Description of the intervention section.

- Rehabilitation-related activities versus usual care or a sham-control intervention
- Structured exercise versus usual care or a sham-control intervention
- Progressive resistance training versus usual care or a sham-control intervention

We performed further post-hoc subgroup analyses to examine the effect of sham interventions in addition to usual care for the outcomes: independence with ADL at hospital discharge and functional mobility at hospital discharge. We compared exercise interventions to usual care (excluding studies using sham-control interventions) and separately compared exercise interventions to sham-control interventions.

Sensitivity analysis

We conducted two sensitivity analyses for all meta-analyses.

- To examine the effect of risk of bias, we removed all studies scored as 'high risk of bias' for the relevant outcomes from meta-analysis of that outcome; the meta-analysis was then conducted if a minimum of two studies assessed at low risk of bias or with some concerns were available.
- To examine the effect of data imputation, we conducted a sensitivity analysis removing all studies with imputed data, providing there were at least two studies remaining with complete data (either reported or supplied by the authors) included in the original meta-analysis.

Summary of findings and assessment of the certainty of the evidence

We followed the guidelines in the *Cochrane Handbook for Systematic Reviews of Interventions*, Chapters 14 and 15 (Schünemann 2022a; Schünemann 2022b), for interpreting results,

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and were aware of distinguishing a lack of evidence of effect from a lack of effect. We based our conclusions only on findings from the quantitative synthesis of included studies for this review. We avoid making recommendations for practice, and our implications for research suggest priorities for future research and outline what the remaining uncertainties are in the area. The summary of findings tables presents outcome-specific information concerning the overall certainty of evidence, the magnitude of effect of the interventions examined and the sum of available data on the main outcomes.

The following outcomes are presented in the summary of findings tables.

- Independence with ADL at hospital discharge.
- Functional mobility at hospital discharge.
- New incidence of delirium during hospitalisation.
- Quality of life at hospital discharge.
- Number of falls during hospitalisation.
- Medical deterioration during hospitalisation.
- Participant global assessment of success at hospital discharge.

We presented the following summary of findings tables.

- Exercise intervention (including all three subgroups – general rehabilitation activities; structured exercise and progressive resistance training) compared to usual care or a sham intervention.
- Rehabilitation-related activity interventions compared to usual care or a sham intervention.
- Structured exercise interventions compared to usual care or a sham intervention.
- Progressive resistance exercise interventions compared to usual care or a sham intervention.

Two review authors (PH, JK) independently assessed the certainty of the evidence using GRADE and resolved disagreements by discussion or involving a third review author (KJ) (Schünemann 2022a). We used the five GRADE considerations (study limitations (overall risk of bias), consistency of effect, imprecision, indirectness and publication bias) to assess the certainty of the body of evidence as it related to the studies that contributed data to the analyses for the prespecified outcomes, and reported the certainty of evidence as high, moderate, low or very low. We justified, documented and incorporated judgements into reporting of results for each outcome.

We used GRADEpro GDT software to prepare the summary of findings tables (GRADEpro GDT). We justified all decisions to downgrade the certainty of evidence for each outcome using footnotes and we made comments to aid the reader's understanding of the review where necessary.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies; Characteristics of studies awaiting classification; and Characteristics of ongoing studies tables.

Results of the search

The search returned 14,971 references. After Covidence automatically removed duplicates, this left 12,278 references for title and abstract review. After title and abstract screening, 108 were carried forward for full-text review, of which 24 studies (35 references) were eligible for inclusion, 70 articles were excluded, one article is awaiting classification and two studies are ongoing.

Included studies

Population

The studies included 7511 participants and 58% were women. The median of the studies' reported mean age was 82.5 years (range 73 to 88 years). Of the 24 studies, 13 were from Europe, six from Oceania, four from North America and one from South America.

Design

Six studies were classified as quasi-RCTs, in three, group allocation was based on the availability of beds (Ekerstad 2017; Mudge 2019; Zelada 2009); in two allocation was based on alternation (Killey 2006; Slaets 1997), and one used four- to eight-week randomisation blocks (Ortiz-Alonso 2020). One study provided no information of the randomisation process other than to report participants were randomised (Blanc-Bisson 2008). de Morton 2007 randomised at ward-level (i.e. the intervention ward was designated via coin toss). All other studies randomised participants individually.

Intervention and comparison

Brief descriptions of the interventions are provided in Table 1 with more detailed description based on the TIDieR checklist provided in Characteristics of included studies table.

Nine interventions were classified as rehabilitation-related activities (Abizanda 2011; Asplund 2000; Counsell 2000; Ekerstad 2017; Fretwell 1990; Landefeld 1995; Sahota 2017; Slaets 1997; Zelada 2009), six as structured exercise (Blanc-Bisson 2008; Brown 2016; Gazineo 2021; Hu 2020; Killey 2006; McGowan 2018a), and nine as progressive resistance training (Courtney 2009; de Morton 2007; Jeffs 2013; Jones 2006; Martinez-Velilla 2019; McCullagh 2020; Mudge 2008; Ortiz-Alonso 2020; Pedersen 2019).

Seven of the nine studies classified as rehabilitation-related activities typically compared medical wards to new geriatric wards or geriatric services (Asplund 2000; Counsell 2000; Ekerstad 2017; Fretwell 1990; Landefeld 1995; Slaets 1997; Zelada 2009). Medical wards were generally described as not having routine physiotherapy, and geriatric wards/services as focused on multidisciplinary working including routine physiotherapy, and often described as having an emphasis on rehabilitation and optimisation of function. The other three studies compared additional therapy time to usual care in the same setting. Abizanda 2011 provided additional daily occupational therapy sessions to the intervention group and Sahota 2017 compared usual care that provided weekday therapy (occupational therapy and physiotherapy) only to a 'seven days per week' therapy service.

All six studies classified as structured exercise used the same setting for their control and intervention arms. In four cases, the setting was medical wards (Brown 2016; Hu 2020; Killey 2006; McGowan 2018a), in the remaining two, the setting was geriatric wards (Blanc-Bisson 2008; Gazineo 2021). Five studies supervised the exercise

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interventions (Blanc-Bisson 2008; Brown 2016; Gazineo 2021; Hu 2020; Killey 2006). In two cases, this was by research staff (Brown 2016; Hu 2020), two by nursing staff (Gazineo 2021; Killey 2006), and in one by a physiotherapist (Blanc-Bisson 2008). Most studies appeared to focus on the frequency and total dose of exercise. In addition to frequency and dose, Blanc-Bisson 2008 also modified the time to first physiotherapy treatment in the intervention group.

All nine studies classified as progressive resistance training used the same setting for their control and intervention arms. In five cases, this was medical wards (de Morton 2007; Jeffs 2013; Mudge 2008; Pedersen 2019; Pedersen 2019), in three it was geriatric wards (Jones 2006; Martinez-Velilla 2019; Ortiz-Alonso 2020), and in one, it was both medical and geriatric wards (McCullagh 2020). All exercise interventions were supervised, in five cases by a physiotherapist (de Morton 2007; Jones 2006; McCullagh 2020; Mudge 2008; Pedersen 2019), two by a fitness specialist (Martinez-Velilla 2019; Ortiz-Alonso 2020), one by a combination of a nurse and physiotherapist (Courtney 2009), and one by a certified allied health assistant (Jeffs 2013).

Due to the varying settings of 'usual care', specifically medical wards or geriatric wards in some cases, what would be the intervention in one study (i.e. in the rehabilitation-related activity subgroup) was very similar to usual care in another. It is apparent that there were differences between countries in terms of what usual care within the same specialities or settings consisted of. For example, Pedersen 2019, a Danish study, referred to national targets to assess function and nutrition and make an appropriate plan within 24 to 48 hours of admission. However, considerable differences in the details reported prevented more detailed comparisons of usual care.

Two studies used a sham intervention in addition to usual care as their control (Brown 2016; McCullagh 2020). Participants in the control arm of Brown 2016 received visits up to twice per day from research assistants "to control for the daily attention" that the exercise intervention group received. Participants in the control arm of McCullagh 2020 received twice-daily supervised stretching and relaxation exercises in lying or sitting positions only.

Of the studies that reported the frequency of sessions, 10 were twice per day (Blanc-Bisson 2008; Brown 2016; de Morton 2007; Jeffs 2013; Jones 2006; Killey 2006; Martinez-Velilla 2019; McCullagh 2020; Mudge 2008; Ortiz-Alonso 2020), five were once per day (Abizanda 2011; Gazineo 2021; Hu 2020; Pedersen 2019; Sahota 2017), one was three times per day (McGowan 2018a), and one was two to four times per week (Courtney 2009).

Adherence to the interventions and total 'dose' of the intervention varied considerably, see Table 1. For example, participants in McGowan 2018a averaged five minutes of exercise across the entire study period, approximately 8% of the prescribed dose, whereas participants in Martinez-Velilla 2019 had an estimated mean of 150 minutes of exercise in total, and an adherence of approximately 90% to the prescribed dose.

Outcomes

We used SMDs to estimate the effect size for independence in ADL at discharge from hospital (Analysis 1.1); functional mobility at discharge from hospital (Analysis 1.2); and walking performance at discharge from hospital (Analysis 2.5).

Studies measured independence in ADL at discharge using the Barthel Index (scale 0 to 100) (Abizanda 2011; de Morton 2007; Gazineo 2021; Jeffs 2013; Jones 2006; Killey 2006; Martinez-Velilla 2019), a customised version of the Barthel Index (scale 0 to 90) (Mudge 2008), or the modified Barthel Index (scale 0 to 20) (Pedersen 2019), a Katz ADL scale (from 0 to 6) (Ortiz-Alonso 2020), a modified Katz ADL scale (from 0 to 5) (Counsell 2000; Landefeld 1995), a modified Katz ADL scale (from 7 to 21) (Brown 2016; Hu 2020), or a modified Katz ADL scale (from 0 to 12) (Blanc-Bisson 2008), or the ADL staircase (scale 0 to 9) (Ekerstad 2017). In all studies apart from three (Blanc-Bisson 2008; Brown 2016; Ekerstad 2017), a higher outcome measure score represented higher levels of independence with ADL.

Studies measured functional mobility using the Short Physical Performance Battery scale (0 to 12) (Martinez-Velilla 2019; McCullagh 2020; Ortiz-Alonso 2020), Physical Performance and Mobility Examination (scale not reported) (Counsell 2000), Functional Ambulation Category (scale 1 to 6) (de Morton 2007), Braden Activity subscale (scale 1 to 4) (Gazineo 2021), Elderly Mobility Scale (scale 0 to 20) (McGowan 2018a), and de Morton Mobility Index (scale 0 to 100) (Pedersen 2019).

Studies measured walking performance using the Timed Up and Go test (de Morton 2007; Ekerstad 2017; Hu 2020; Jones 2006), distance able to be walked (Killey 2006), and walking speed over 4 m (Pedersen 2019).

Excluded studies

We excluded 70 studies/reports based on reading the full-text manuscripts. The most common reason was the study's setting (14 were base in inpatient rehabilitation, five in the community, one in critical care). Other reasons for exclusion included that participants were randomised after 72 hours of their hospital admission (eight) and not general medical populations (eight). See Figure 1 and Characteristics of excluded studies table for a full list of reasons for exclusion.

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Figure 1. Study flow diagram

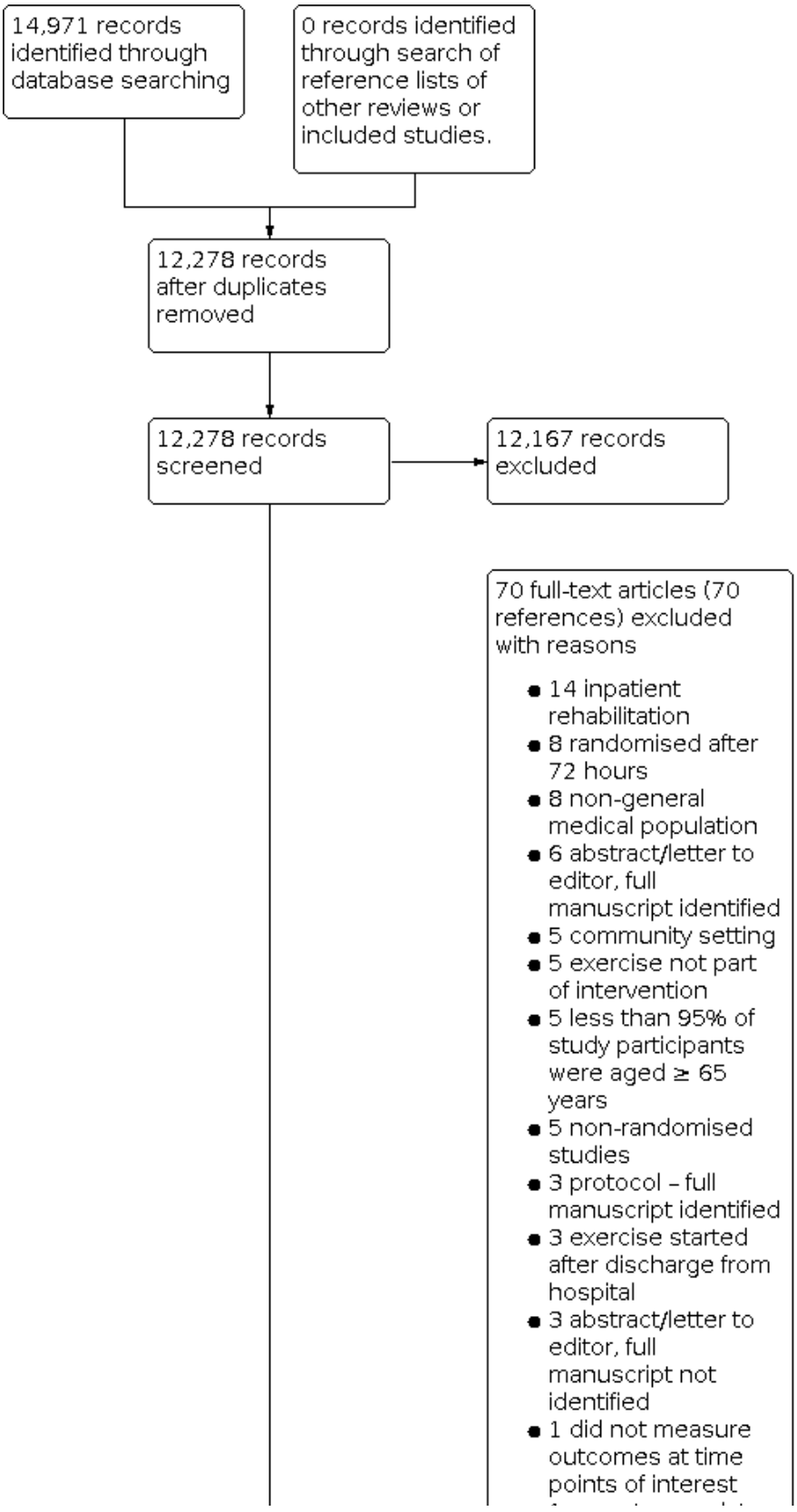

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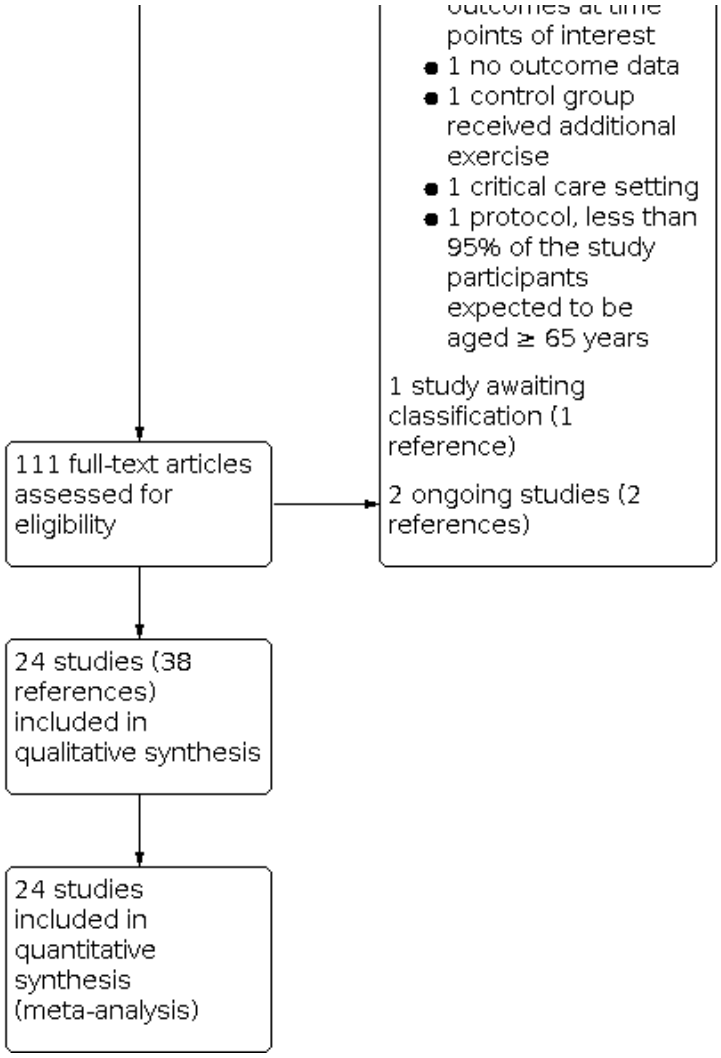
Figure 1. (Continued)



Studies awaiting classification

One study is awaiting classification as our literature search identified the study registration, but it was not completed by the time we submitted the review (Kojaie-Bidgoli 2021). See Characteristics of studies awaiting classification table.

Ongoing studies

There are two ongoing studies (NCT03604640; NCT04600453). See Characteristics of ongoing studies table.

Risk of bias in included studies

See risk of bias judgements for each outcome in the Characteristics of included studies table, and at the side of the forest plots. The summarised justifications for each judgement are found in the Risk of bias section, and full justifications with answers to each signalling question are available at: 10.6084/m9.figshare.16685023. Common reasons for a study outcome to be judged at high risk were bias due to the randomisation process and bias in the measurement of the outcome. Five studies were at high risk of bias arising from the randomisation process (Ekerstad 2017; Killey 2006; Mudge 2008; Ortiz-Alonso 2020; Zelada 2009). In all cases, this was due to methods of intervention allocation lacking concealment, either due to a predictable randomisation sequence (e.g. alternating) or allocation based on availability of beds and the decisions of the admitting clinicians.

Several major outcomes had high proportions of studies assessed at high risk of bias (independence of ADL 11/16, functional mobility 6/8, incidence of delirium 3/7, falls 2/4 and medical deterioration 2/11). The most common domain at high risk of bias was measurement of the outcome. This included the outcomes: independence of ADL and functional mobility. Of the 11 studies judged at high risk of bias overall for ADL, eight were at high risk of bias in measurement of the outcome, four due to the randomisation process, three due to missing outcome data and one for deviation from the intended interventions. Of the six studies measuring functional mobility that were at high risk of bias overall, five were at high risk of bias in measurement of the outcome, one due to missing outcome data and one due to the randomisation process (in addition to high risk of bias in measurement of the outcome).

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Effects of interventions

See: **Summary of findings 1** Summary of findings table - Exercise interventions compared to usual care with or without sham interventions for acutely hospitalised older medical patients; **Summary of findings 2** Summary of findings table - Rehabilitation-related activity interventions compared to usual care with or without sham interventions for acutely hospitalised older medical patients; **Summary of findings 3** Summary of findings table - Structured exercise interventions compared to usual care with or without sham interventions for acutely hospitalised older medical patients; **Summary of findings 4** Summary of findings table - Progressive resistance exercise interventions compared to usual care with or without sham interventions for acutely hospitalised older medical patients

Exercise interventions compared to usual care with or without sham interventions for acutely hospitalised older medical patients

Results are presented for overall (Summary of findings 1) and subgroup analyses by type of exercise shown in Summary of findings 2; Summary of findings 3; and Summary of findings 4.

Major outcomes

1.1 Functional ability: independence in activities of daily living at discharge from hospital

We identified 18 trials that reported independence in ADL at discharge following inpatient exercise or usual care for older people admitted to hospital for medical illnesses (Analysis 1.1). Sixteen were included in a meta-analysis. Two trials reported this outcome as a categorical outcome rather than continuous (Slaets 1997; Zelada 2009).

There was little to no difference in independence in ADL at hospital discharge in people receiving exercise compared to usual care (SMD 0.09, 95% CI −0.02 to 0.19; 16 trials, 5174 participants; low-certainty evidence downgraded for risk of bias and inconsistency). Of the seven studies that measured independence with ADL using the Barthel Index (scale 0 to 100, with 100 representing highest level of independence), the scores in the control group ranged from 42 to 96 points at discharge from hospital, and the estimated SMD was equivalent to a 1.84 (95% CI 0.43 lower to 4.12 higher) points better on the Barthel Index at discharge from hospital in the exercise intervention group. We approximated a minimally clinically important difference in the Barthel Index using the methodology described by Norman 2003 of half an SD. Half of the pooled baseline SD of the studies using the Barthel Index was 11. Therefore, the SMD and CI do not represent a meaningful benefit. We downgraded the certainty of evidence to low due to inconsistency (I^2 = 66%, 95% PI for SMD −0.25 to 0.42) and risk of bias due to bias in randomisation, missing data and measurement of the outcome. There was no publication bias detected from visual inspection of the funnel plot (Figure 2).

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Figure 2. Funnel plot: independence with activities of daily living at discharge from hospital.

We performed a sensitivity analysis by removing studies judged at high risk of bias (Blanc-Bisson 2008; Counsell 2000; de Morton 2007; Ekerstad 2017; Gazineo 2021; Hu 2020; Killey 2006; Landefeld 1995; Mudge 2008; Ortiz-Alonso 2020; Pedersen 2019). There was no meaningful change of the estimate of the effect (SMD 0.06, 95% CI −0.20 to 0.33; 5 trials, 1502 participants) and imputed data did not suggest a clinically meaningful benefit (SMD 0.21, 95% CI 0.05 to 0.37; 8 trials, 2939 participants).

Subgroup analysis of studies that did not use a sham intervention (i.e. all studies other than Brown 2016) did not meaningfully change the estimate of the effect (SMD 0.11, 95% CI −0.00 to 0.21; 15 trials, 5080 participants). Brown 2016 reported no difference between ADL score at discharge (8.1 (SD 0.29) in the intervention group versus 8.0 (SD 0.25) in the control group; scale 7 to 21, with 7 representing the greatest independence with ADL; P = 0.96).

Two studies were not included in meta-analyses (Slaets 1997; Zelada 2009). Slaets 1997 reported a greater proportion of participants in the intervention group improved their Barthel Index scores from admission to discharge than those in the control group (61.3% with intervention versus 45.7% with control) and fewer deteriorated (2.5% with intervention versus 14.1% with control). Zelada 2009 reported 13 (19.1%) participants in the intervention group exhibited functional deterioration on discharge relative to 30 (40%) participants admitted to the conventional care unit. Both studies were at high risk of bias due to lack of a blinded assessor.

Subgroup meta-analyses by type of exercise did not differ meaningfully from the overall analyses (rehabilitation-related activities subgroup: SMD 0.00, 95% CI −0.12 to 0.13; 4 trials, 2838 participants; Summary of findings 2); structured exercise subgroup: SMD 0.12, 95% CI −0.21 to 0.45; 5 trials, 648 participants; Summary of findings 3; progressive resistance exercise subgroup: SMD 0.14, 95% CI −0.05 to 0.32; 7 trials, 1688; Summary of findings 4; low-certainty evidence downgraded for bias and inconsistency).

1.2 Functional ability: functional mobility at discharge from hospital

Nine studies reported a measure of functional mobility at discharge from hospital. Eight were included in the meta-analysis (Analysis 1.2). One study reported this outcome with categorical rather than continuous data (Slaets 1997), so results are included as a narrative description only.

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The evidence is very uncertain about the effect of exercise on functional mobility at discharge from hospital compared to usual care (SMD 0.28, 95% CI −0.01 to 0.56; 8 trials, 2369 participants; Summary of findings 1; very low-certainty evidence downgraded for bias and inconsistency). Of the three studies that measured functional mobility using the Short Physical Performance Battery (possible scores range from 0 to 12, with 12 representing best level of function), the scores in the control group ranged from 3.7 to 4.9 at discharge from hospital and the estimated SMD was equivalent to 0.78 (95% CI 0.02 lower to 1.57 higher) points better in the exercise intervention group. A minimally clinically important difference in the Short Physical Performance Battery has been reported as 1.0 point in older adults (Perera 2006). The certainty of evidence was downgraded two levels due to high inconsistency (I^2 = 90%, 95% PI for SMD −0.52 to 1.07), and one level for risk of bias due to bias in randomisation, missing data and measurement of the outcome.

Slaets 1997 reported that 47.9% of the intervention group improved their mobility scores compared to 43.5% in the control group and none in the intervention group deteriorated in mobility compared to 6.5% in the control group. The study is at high risk of bias due to the lack of a blinded assessor.

We performed a sensitivity analysis after removing studies at high risk of bias. There was benefit in favour of the intervention (SMD 0.52, 95% CI 0.31 to 0.74; 2 trials, 478 participants). Sensitivity analysis after removing studies with imputed data did not differ meaningfully from the overall analyses (SMD 0.22, 95% CI −0.02 to 0.45; 6 trials, 1953 participants).

Subgroup analysis of only studies that did not use a sham intervention (i.e. all studies other than McCullagh 2020) did not result in a meaningful change from the overall analyses (SMD 0.26, 95% CI −0.06 to 0.58; 7 trials, 2194 participants). McCullagh 2020 reported a benefit in the Short Physical Performance Battery in favour of the intervention group at discharge from hospital (MD 0.88, 95% CI 0.20 to 1.57; P = 0.01). The results of McCullagh 2020 do not differ meaningfully from Analysis 1.2.

Subgroup analysis of rehabilitation-related activities was not possible as only one study reported the outcome: Counsell 2000 reported an MD of 0.63 (95% CI 0.09 to 1.17) in the Physical Performance and Mobility Examination at discharge, favouring the exercise intervention group. There was no effect with structured exercise or progressive resistance training (structures exercise: SMD 0.39, 95% CI −0.75 to 1.53; 2 trials, 416 participants; Summary of findings 3; progressive resistance training: SMD 0.24, 95% CI −0.09 to 0.56; 5 trials, 978 participants; Summary of findings 4; very low-certainty evidence downgraded for bias, imprecision and inconsistency). Subgroup analysis did not explain the inconsistency observed, and we were unable to identify the cause of the high inconsistency.

1.3 Functional ability: new incidence of delirium during hospitalisation

There was little to no difference in the incidence of delirium during hospitalisation between groups (73 per 1000 participants, 95% CI 47 to 114 per 1000 with exercise versus 81 per 1000 participants with control group; RR 0.90, 95% CI 0.58 to 1.41; 7 trials, 2088 participants; Analysis 1.3; Summary of findings 1; very low-certainty evidence). We downgraded the certainty of the evidence due to risk of bias in randomisation and measurement of the outcome, inconsistency (I^2 = 39%, 95% PI for RR 0.40 to 2.05), and imprecision. We downgraded certainty for imprecision as there were fewer than 200 events in total and a control event rate of approximately 10%; hence an optimal information size was unlikely to have been met (Guyatt 2011). In addition, the CIs around the pooled effect included appreciable benefit and appreciable harm (i.e. an RR of less than 0.75 and greater than 1.25).

We performed a sensitivity analysis removing studies at high risk of bias (Asplund 2000; Brown 2016; Mudge 2008). There was no meaningful change from the main analysis (RR 0.88, 95% CI 0.50 to 1.55; 4 trials, 1451 participants). Subgroup analysis of rehabilitation-related activities and progressive resistance training did not differ meaningfully from the main analysis (rehabilitation-related activities: RR 0.86, 95% CI 0.30 to 2.50; 2 trials, 732 participants; Summary of findings 2; progressive resistance training: RR 0.96, 95% CI 0.55 to 1.68; 4 trials, 1256 participants; Summary of findings 4). Subgroup analysis of the structured exercise group was not possible as only one study reported this outcome. The study found only one incidence of delirium in the intervention group and none in the control group (Brown 2016).

1.4 Quality of life at discharge from hospital

We identified five studies that reported a measure of quality of life at discharge from hospital (Analysis 1.4). The mean quality of life scores on the EQ-5D visual analogue scale (VAS) ranged between 48.7 and 64.7 in the control groups at discharge from hospital. Participants who received an exercise intervention may have had better quality of life (EQ-5D VAS, higher scores indicate better quality of life) at discharge from hospital than those in the control group (MD 6.04 points higher, 95% CI 0.90 to 11.18; I^2 = 70%; 4 trials, 875 participants; low-certainty evidence downgraded twice for inconsistency; 95% PI for MD −3.77 to 15.86; Summary of findings 1), but this improvement was not clinically important. A minimally clinically important difference in the EQ-5D VAS was approximated at 10 points, using the distribution-based methods described by Norman 2003.

We performed a sensitivity analysis after removing studies judged at high risk of bias (Ekerstad 2017; Hu 2020). There was no change from the main analysis (MD 8.90 points higher, 95% CI 2.35 to 15.45; 2 trials, 449 participants).

The subgroup analysis of the progressive resistance exercise group showed a benefit (MD 8.90 points higher, 95% CI 2.35 to 15.45; 2 trials, 449 participants). Subgroup analysis was not possible for the rehabilitation-related activities or structured exercise programme groups as they both included only one study. Ekerstad 2017 reported an MD of 2.20 points (95% CI −1.9 to 6.3) with rehabilitation-related activities. Hu 2020 reported an MD of 3.7 points (95% CI −6.32 lower to 13.8 higher) with the structured exercise programme. Both of these studies were at high risk of bias.

1.5 Falls during hospitalisation

We identified nine studies that reported the number of falls during hospitalisation. There was no evidence of a difference in risk of falls during hospitalisation between exercise intervention and usual care groups (RR 0.99, 95% CI 0.59 to 1.65; 9 trials, 1787 participants). This is equivalent to 34 per 1000 participants in the control groups experiencing a fall compared to 34 per 1000 participants (95% CI 20 to 57) in the intervention groups (moderate-certainty evidence;

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Analysis 1.5; Summary of findings 1). We downgraded certainty for imprecision due to there being fewer than 60 events in total and a control event rate of approximately 2.5%, and an OIS is unlikely to have been met (Guyatt 2011). The CIs included appreciable benefit and harm (i.e. an RR less than 0.75 or more than 1.25).

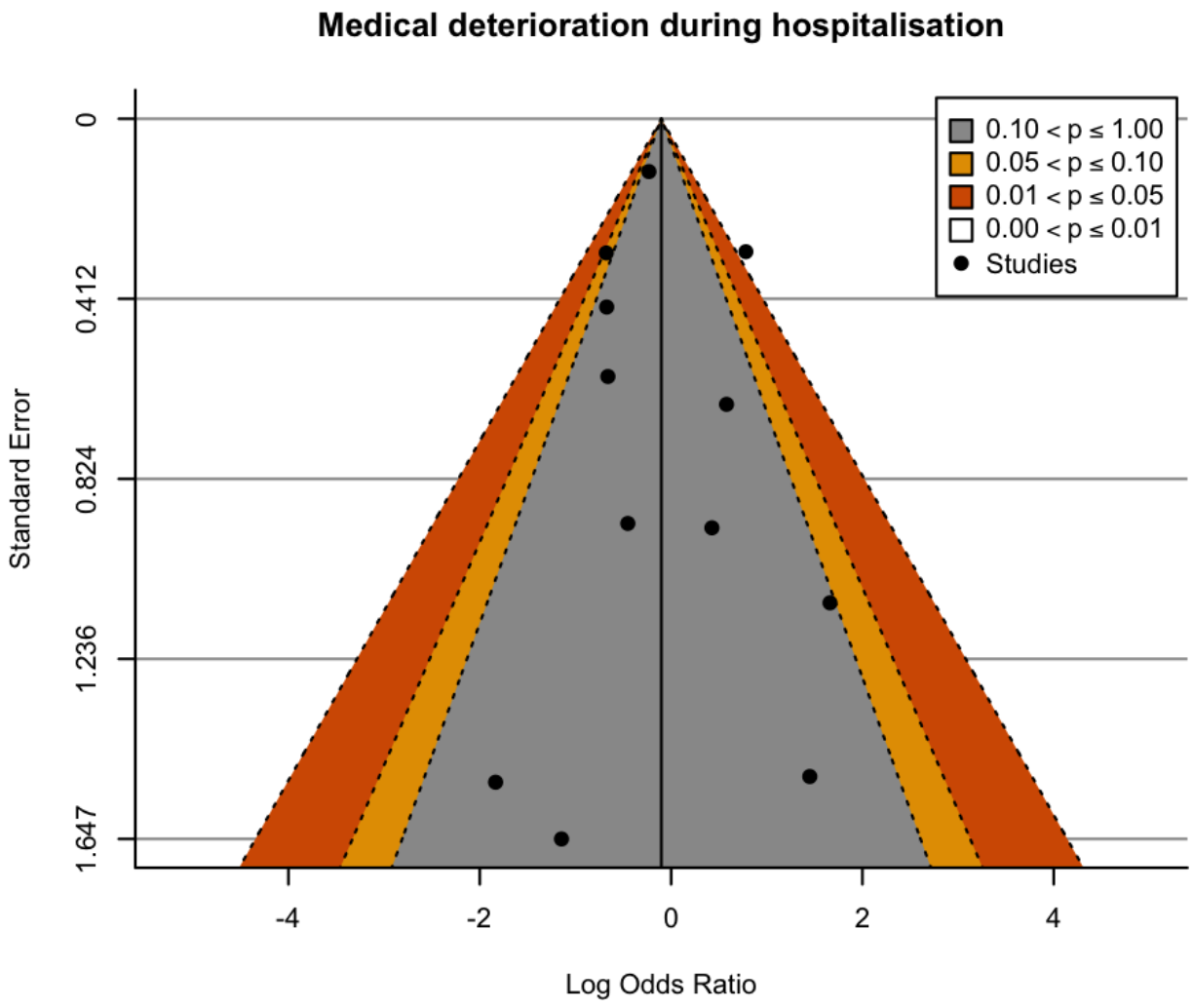
We performed a sensitivity analysis after removing studies judged at high risk of bias (Killey 2006; Mudge 2008). There was no meaningful change from the main analysis (RR 1.20, 95% CI 0.67 to 2.13; 7 trials, 1608 participants).

Subgroup analysis was not possible for the rehabilitation-related activities subgroup as only one study provided this outcome. Sahota 2017 reported four falls during hospitalisation in the intervention group and three in the control group. In the structured exercise group and progressive resistance training group, there was no evidence of a difference from the main analysis (structure exercise: RR 0.76, 95% CI 0.23 to 2.53; 3 trials, 542 participants; Summary of findings 3; progressive resistance training: RR 0.96, 95% CI 0.48 to 1.91; 5 trials, 995 participants; Summary of findings 4).

1.6 Medical deterioration during hospitalisation

There was no evidence of a difference in risk of medical deterioration during hospitalisation between exercise and usual care groups (RR 1.02, 95% CI 0.62 to 1.68; 11 trials, 2730 participants; Analysis 1.6; Summary of findings 1; very low-certainty evidence). This is equivalent to 71 participants per 1000 experiencing medical deterioration in the control group compared to 73 per 1000 (95% CI 44 to 120) in the intervention group. We downgraded certainty of the evidence for inconsistency (I^2 = 51%, 95% PI for RR 0.33 to 3.19), imprecision as there were fewer than 200 events and a control rate of approximately 7%, hence an OIS was unlikely to have been met (Guyatt 2011). In addition, the CI around the estimated effect indicated that the true effect could range from appreciable harm to benefit; and indirectness, as outcomes varied between studies (i.e. some studies reported general medical deterioration (such as admission to critical care), some reported new incidences of delirium and some studies reported both). There was no publication bias from visual inspection of the funnel plot (Figure 3).

Figure 3. Funnel plot: medical deterioration during hospitalisation.



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We performed a sensitivity analysis by removing the studies judged at high risk of bias (Asplund 2000; Mudge 2008). There was no meaningful change in the results (RR 1.06, 95% CI 0.58 to 1.92; 9 trials, 2193 participants). Subgroup analyses of the rehabilitation-related activities and progressive resistance training groups did not differ meaningfully from the main analysis (rehabilitation-related activities: RR 0.86, 95% CI 0.30 to 2.50; 2 trials, 732 participants; Summary of findings 2; progressive resistance training: RR 0.99, 95% CI 0.52 to 1.87; 7 trials, 1798 participants; Summary of findings 4). Subgroup analyses of the structured exercise programme showed no evidence of a difference with CIs including both a benefit and harm (RR 2.56, 95% CI 0.48 to 13.54; 2 trials, 200 participants; Summary of findings 3).

1.7 Participant global assessment of success at discharge from hospital

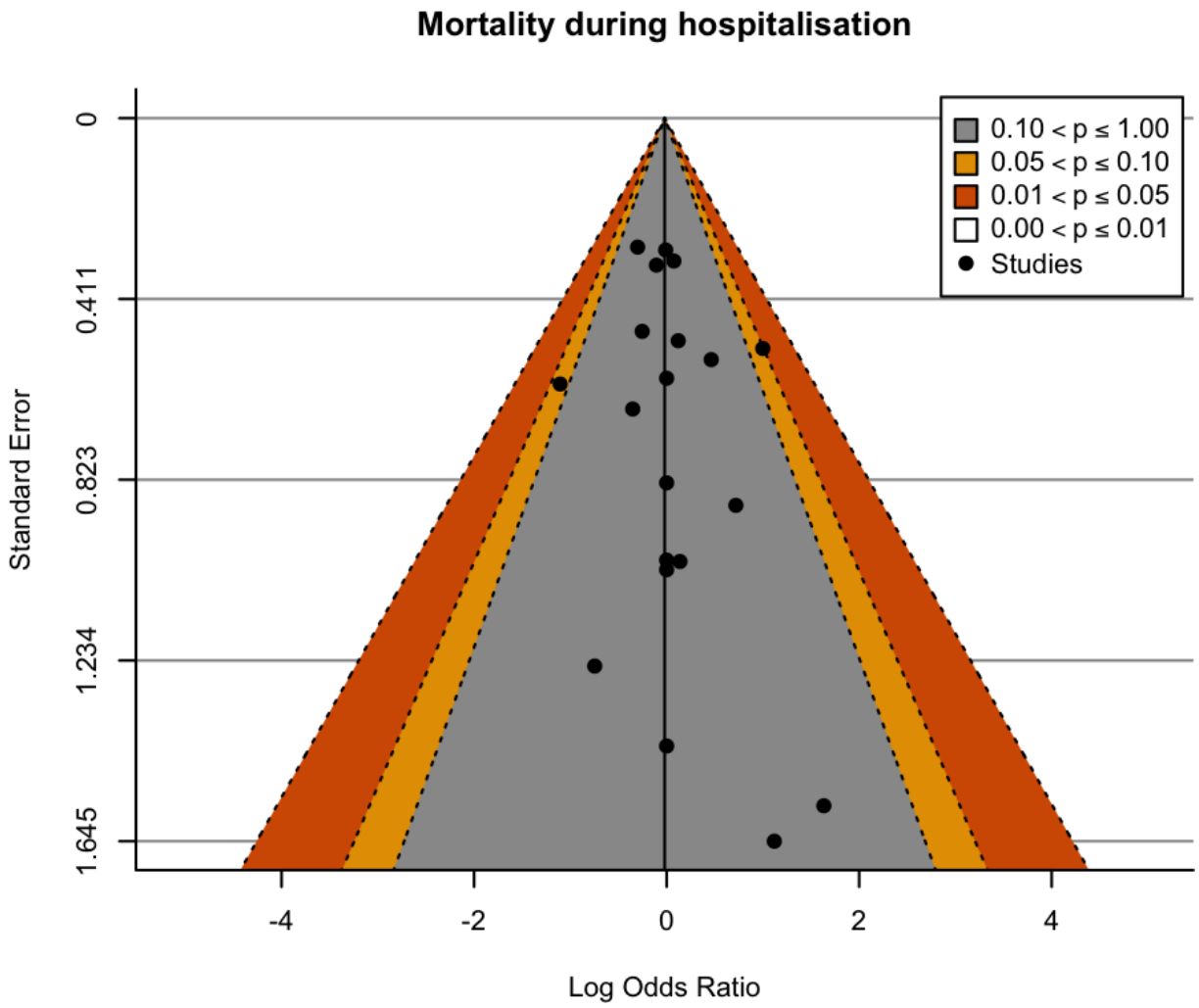
No studies reported participant global assessment of success at discharge from hospital.

Minor outcomes

2.1 Death during hospitalisation

There was no evidence of a difference in risk of mortality during hospitalisation between exercise and usual care groups (RR 0.98, 95% CI 0.79 to 1.22; 20 trials, 6822 participants; Analysis 2.1; moderate-certainty evidence). This is equivalent to 46 in 1000 participants dying during hospitalisation in the control group compared to 45 per 1000 participants (95% CI 37 to 56) in the intervention group. We downgraded the certainty of the evidence once for imprecision. There was no publication bias from visual inspection of the funnel plot (Figure 4). Sensitivity and subgroup analysis showed no difference between groups.

Figure 4. Funnel plot: mortality during hospitalisation.



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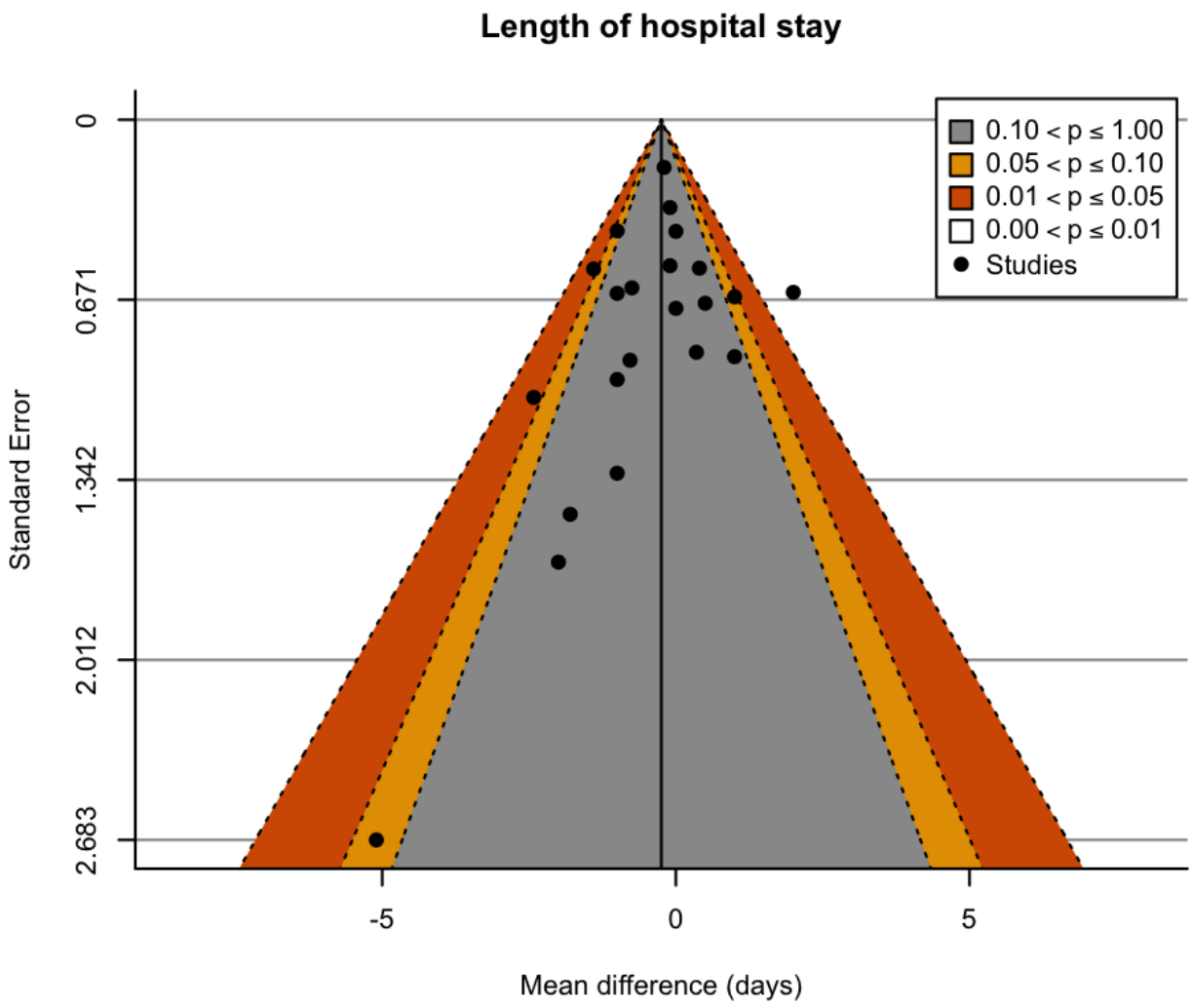
2.2 Musculoskeletal injuries during hospitalisation

No studies reported the incidence of musculoskeletal injuries that occurred during hospitalisation; one study reported that no injuries occurred during treatment sessions (Abizanda 2011).

2.3 Hospital length of stay

Exercise interventions resulted in little to no difference in the length of hospital stay (MD −0.25 days, 95% CI −0.62 to 0.12 days; 22 trials, 7182 participants; Analysis 2.2; Figure 5; very low-certainty evidence downgraded for inconsistency, imprecision and possible publication bias).

Figure 5. Funnel plot: length of hospital stay.



Sensitivity analysis after removing studies judged at high risk of bias and imputed data did not meaningfully differ from the main results. Subgroup analysis of the rehabilitation-related activities group showed that there may be a benefit (MD −0.55 days, 95% CI −1.42 to 0.32 days; 9 trials, 4388; low-certainty evidence downgraded for inconsistency and imprecision). Subgroup analysis of the structured exercise group and progressive resistance training group showed little to no difference in length of hospital stay.

2.4 New institutionalisation at hospital discharge

Exercise interventions resulted in no difference to the risk of new institutionalisation at hospital discharge (RR 0.91, 95% CI 0.74 to 1.12; 5 trials, 2364 participants; Analysis 2.3; moderate-certainty evidence downgraded for imprecision). Sensitivity and subgroup analysis showed no difference between groups.

2.5 Readmission to hospital

Exercise interventions during hospitalisation resulted in no change to the risk of hospital readmission (RR 0.95, 95% CI 0.81 to 1.11; 14 trials, 4689 participants; Analysis 2.4; moderate-certainty evidence downgraded for imprecision). Sensitivity analysis and subgroup analysis of the rehabilitation-related activities and progressive resistance exercise groups did not differ meaningfully from the main analysis. Subgroup analysis of the structured exercise was not conducted as only one study measured hospital readmissions. Gazineo 2021 reported 33/174 participants in the intervention group versus 40/165 participants in the control group required

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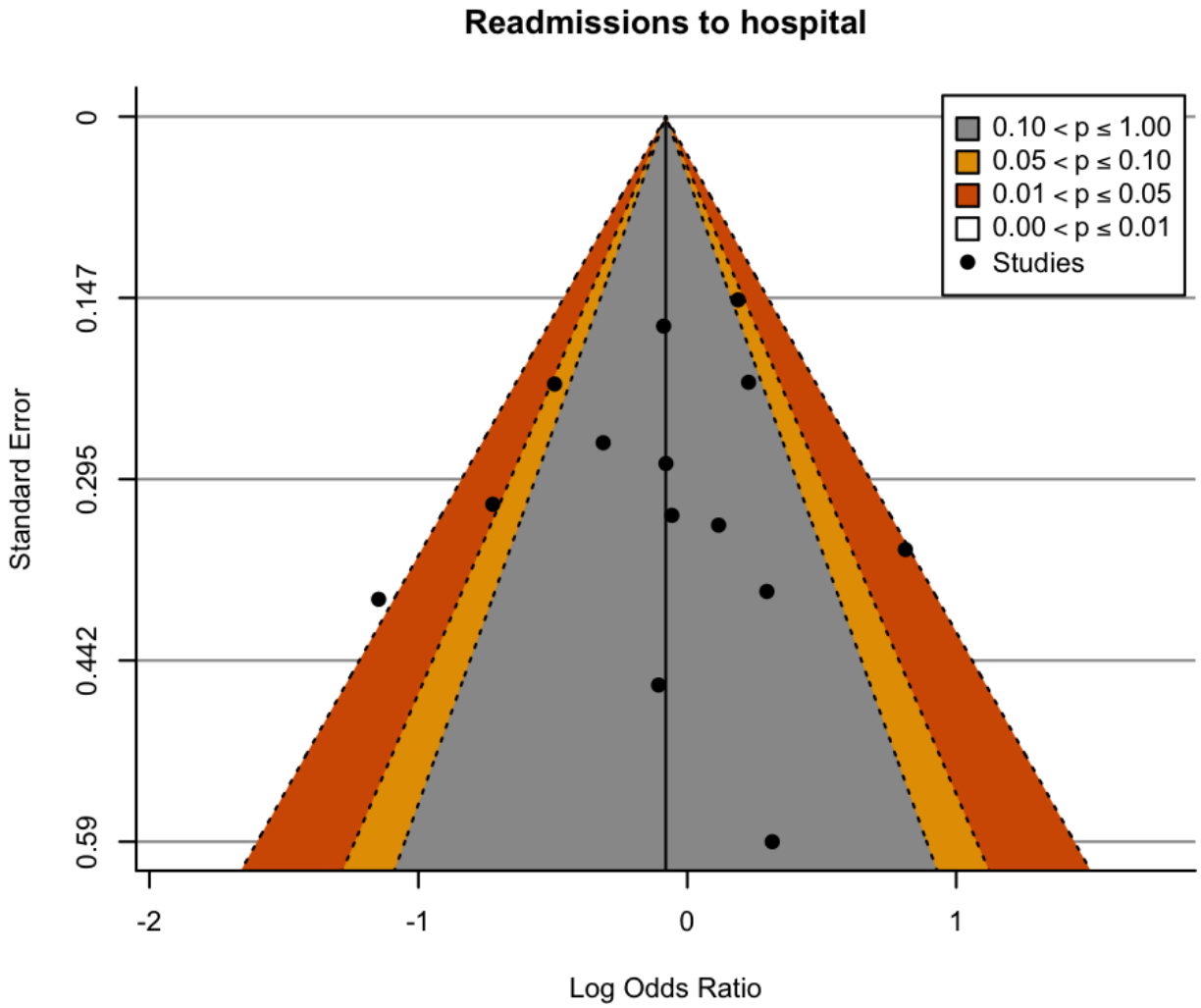
hospital readmission within 30 days of discharge from hospital. There was no publication bias from visual inspection of the funnel plot (Figure 6).

Figure 6. Funnel plot: readmissions to hospital.



2.6 Walking performance at discharge from hospital

Exercise interventions had little to no effect on walking performance at discharge from hospital (SMD −0.13, 95% CI −0.35 to 0.09; 6 trials, 682 participants; Analysis 2.5; very low-certainty evidence downgraded for inconsistency, imprecision and bias). One study was not included in the meta-analysis as it presented results as categories (Mudge 2008). The study reported similar proportions of participants in each category of the Timed Up and Go (less than 20 seconds: 56% with intervention versus 50% with control; 20 to 40 seconds: 29% with intervention versus 24.2% with control; greater than 40 seconds or unable to complete test: 14.5% with intervention versus 26.8% with control; P = 0.37 for all three categories).

Sensitivity analysis was not possible as all studies were at high risk of bias. We performed a sensitivity analysis after removing studies with imputed data. There was no meaningful change from the overall analyses (SMD −0.16, 95% CI −0.47 to 0.15; 4 trials, 553 participants). Subgroup analysis of the structured exercise and progressive resistance exercise groups showed no difference between groups.

DISCUSSION

Summary of main results

Twenty-four studies (7511 participants) met the inclusion criteria for this review. Exercise interventions may provide little to no improvements in independence with ADL and may slightly improve the quality of life at discharge from hospital, although the certainty of evidence was low. There is very low-certainty evidence on the effect of exercise interventions on functional mobility and walking performance at discharge from hospital and the incidence of new delirium during hospitalisation. Of the included adverse events outcomes, exercise interventions have no effect on the number of falls (moderate-certainty evidence) or mortality during hospitalisation (moderate-certainty evidence). We are uncertain

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whether exercise interventions affect medical deterioration during hospitalisation (very low-certainty evidence). There were no studies reporting incidence of musculoskeletal injuries during hospitalisation. In addition, no studies reported participant global assessment of success. The exercise interventions resulted in non-meaningful differences in length of hospital stay (very low-certainty evidence), new institutionalisation (moderate-certainty evidence), and hospital readmissions (moderate-certainty evidence).

Subgroup analyses of the nine studies investigating the effect of interventions classified as rehabilitation-related activities showed very-low certainty evidence with regard to the effect of the intervention on independence with ADL at hospital discharge, incidence of new delirium during hospitalisation, and medical deterioration during hospitalisation. Rehabilitation-related activity interventions reduced the length of hospital stay by over half a day (low-certainty evidence), but appeared to have no meaningful effect on new institutionalisation at discharge from hospital (moderate-certainty evidence), or hospital readmissions (moderate-certainty evidence). Meta-analysis to estimate the effect of rehabilitation-related activities on functional mobility, quality of life or walking performance at hospital discharge, or the incidence of falls during hospitalisation was not possible, since only one study reported each outcome.

As with the main analysis, subgroup analysis of structured exercise interventions suggested a small but not clinically meaningful improvement in independence with ADL at hospital discharge in the intervention group, and a non-meaningful effect on the number of falls, but the certainty of evidence was assessed as being low for both outcomes. The evidence for the effects of structured exercise on functional mobility and walking performance at hospital discharge, or medical deterioration during hospitalisation were of very low certainty. The structured exercise interventions had no effect on mortality during hospitalisation (moderate-certainty evidence) or length of stay (low-certainty evidence). There were insufficient data to perform meta-analyses on the effect of structured exercise interventions on the incidence of delirium during hospitalisation (one study), quality of life at hospital discharge (one study), hospital readmissions (one study), or new institutionalisation at hospital discharge (no studies).

In the subgroup analyses of the nine studies investigating the effect of interventions that included progressive resistance training, there was no meaningful difference to the main overall analysis in the direction or size of the intervention effect for all outcomes.

Subgroup analyses separating studies that used sham-control interventions and those that did not for the outcomes of independence with ADL at hospital discharge and functional mobility at hospital discharge, did not produce meaningfully different results or explain the observed heterogeneity in the main analyses.

Overall completeness and applicability of evidence

The main limitations in generalising the findings of the review are that they are limited to general medical populations and participants who were recruited in the first days of an acute hospital admission.

We conducted meta-analyses for all major and minor outcomes other than participant global assessment of success and musculoskeletal injuries during hospitalisation. However, the certainty of evidence was generally low or very low, and further high-quality research may not produce substantially different effects but could improve the certainty of the evidence. Inconsistencies in future analyses may be reduced if trials are conducted using consistent descriptions of sample characteristics, using the same outcome measures, such as a uniform measure of baseline level of function, and consistent reporting of exercise dose, intensity and adherence.

Certain outcomes should be interpreted with additional caveats. The effect of exercise interventions on hospital outcomes such as length of stay and readmissions may vary considerably depending on the context, in particular the health and social care systems in which they are conducted and the opportunities that exist within these systems to modify such outcomes. As such, the generalisability of the outcomes may be very limited. Walking performance at hospital discharge was treated as a continuous outcome and does not allow for differences in the number of participants in each arm who were able to walk. Finally, as noted in an individual participant data meta-analysis using the data from de Morton 2007 and Jones 2006 (two studies included in this review), a ceiling effect in the Barthel Index is believed to limit the ability to accurately measure change in more functionally independent people (de Morton 2007b). This was also apparent in two further studies included in this review. Pedersen 2019 reported modified Barthel Index scores of 20/20 in both the intervention and control groups at discharge; Jeffs 2013 reported mean discharge scores in the Barthel Index of 95/100 in the intervention group and 96/100 in the control group. This may have reduced the size of the effect observed in the meta-analysis of independence in ADL at hospital discharge.

Other than hospital readmissions, the time point used for the analysis of all outcomes was at hospital discharge. This time point was selected as the most likely time to observe a treatment effect should one exist. The results cannot be generalised to a longer follow-up period.

One study is awaiting classification to be included in the next update of this review (Kojaie-Bidgoli 2021). The study registration was identified in our literature search but was not completed at the time we submitted the review. It is believed that the data are unlikely to change the conclusions of this current review. We will update this review as more trials become available.

Quality of the evidence

Using the GRADE criteria, we downgraded the certainty of the evidence for all outcomes. This was predominantly due to risk of bias, inconsistency and imprecision. Inconsistency and heterogeneity did not appear to be explained by the combining of the subgroups of interventions in the meta-analysis, as heterogeneity within the subgroups was highly prevalent. Exercise dose and adherence varied considerably and may explain some heterogeneity, but inconsistency in the reporting of the interventions and adherence prevents further inference. Imprecision was particularly prevalent in the binary outcomes due to low numbers of events and consequently, the meta-analysis did not reach an optimal information size to provide confidence in the derived results.

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The main difference in risk of bias by outcome was between 'soft' outcomes (i.e. required judgement by the assessor or participant or could be influenced by the assessor's behaviour) and 'hard' outcomes. Soft outcomes included: independence in ADL at discharge from hospital, functional mobility at discharge from hospital, incidence of delirium during hospitalisation, quality of life at discharge from hospital and walking performance at discharge from hospital. As only nine of 24 studies used blinded outcome assessors, these soft outcomes would result in a high risk of bias for measurement of the outcome in the studies with non-blinded assessors. Consequently, the meta-analyses of all five soft outcomes had a high risk of bias for 50% or more of the included studies, compared to the 'hard' outcomes such as falls during hospitalisation, medical deterioration during hospitalisation, mortality during hospitalisation, length of stay and hospital readmissions, which all had less than 30% of included studies with a judgement of being at high risk of bias. Typically, a lack of outcome-assessor blinding for hard outcomes led to a judgement of 'some concerns' for the 'measurement of the outcome' domain. The GRADE rating of certainty was downgraded due to risk of bias for ADL at discharge from hospital, functional mobility at discharge from hospital and incidence of delirium during hospitalisation, and results need to be interpreted accordingly.

The other notable distinction in risk of bias by outcome was for walking performance. Five of six studies included in the analysis were at high risk of bias due to missing data. This reason for missing data was presumed or known to be dependent on the true value as participants were unable to walk.

Publication bias may explain the asymmetry seen in the funnel plot of length of hospital stay (Figure 5). Given the lack of a meaningful effect size, imprecision and inconsistency, it is unlikely that if publication bias did exist, it has had a meaningful effect on the findings.

The highest certainty of evidence was for the number of falls during hospitalisation (overall analysis), which was at moderate certainty. The outcome was downgraded for imprecision, as due to only 62 events an optimal information size is unlikely to have been met (Guyatt 2011), and the 95% CIs included both an appreciable harm and a benefit. The outcome was not downgraded further for imprecision as we made an a priori decision to downgrade two levels only for outcomes with fewer than 50 events. The outcome was not downgraded for risk of bias, as removal of two of nine studies assessed at high risk of bias did not meaningfully change the estimate of the effect, neither was it downgraded for imprecision (I^2 = 0%). Further, publication bias was not assessed as there were fewer than 10 studies, and the outcome was not considered as indirect.

Potential biases in the review process

Adverse events during hospitalisation were initially planned to be reported as a combined outcome. As adverse events were expected to be defined differently by different studies, the plan was to include any and all data for mortality, falls, medical deterioration and musculoskeletal injury as a combined adverse-event outcome. However, we changed this for three reasons.

- Combining the outcomes might have led to double counting of participants who experienced an adverse event (e.g. if the same participant experienced both a fall and medical deterioration).
- The estimate of baseline risk of experiencing an adverse event would have been very different depending on the number and type of adverse events reported by the different studies.
- Interpretation of the analysis for the combined outcome would be very challenging due to the very different natures of the individual outcomes.

Therefore, we decided not to combine the outcomes, but to analyse each separately. However, this had the effect of reducing precision, since there were lower numbers of events for each outcome than would have been available if a combined outcome had been used.

We made the decision not to distinguish between studies that used a sham-control intervention and those that did not. This decision introduced the potential for methodological diversity to increase the statistical heterogeneity in the analyses. We theorised that the large variation in usual care (i.e. the clinical diversity) would represent more interstudy variability in the control arm than the inclusion of a sham intervention. This appears to be supported by the lack of significant differences in the estimate of effect or observed heterogeneity in the post-hoc subgroup analyses that we performed for the outcomes: independence with ADL at hospital discharge and functional mobility at hospital discharge.

Two review authors (JK, KJ) conducted included studies. They were not involved in the risk of bias assessments of their studies.

Agreements and disagreements with other studies or reviews

Six previous reviews have investigated exercise for acutely hospitalised older adults, albeit with differences in methodology and focus (de Morton 2007a; Kosse 2013; Martínez-Velilla 2016; Kanach 2018; Valenzuela 2020; Reynolds 2021).

The original Cochrane Review concluded that "exercise sessions may not lead to any difference in function, harms, length of stay in hospital or whether they go home or to a nursing home or other care facility" (de Morton 2007a). However, it had more positive conclusions for exercise prescribed as a component of a multidisciplinary intervention, suggesting that although it 'may not lead to any difference in function or harms', it 'may slightly reduce the length of stay in hospital' (de Morton 2007a). The favourable findings regarding length of stay were based on a meta-analysis of five studies, which estimated a mean reduction in length of stay of one day, which is more than the reduction of half a day observed in the rehabilitation-related activities meta-analysis in this review. This is partly explained by the exclusion of two of the five studies in the original review from this review because they included elective and surgical patients.

The narrative review of Kosse 2013 concluded that "at time of discharge, patients who had participated in a multidisciplinary programme or exercise programme improved more on physical functional tests […] In addition, multidisciplinary programmes reduced the length of hospital stay significantly." Their conclusion was based on two of nine studies showing effects in favour of an exercise intervention benefiting independence with ADL at discharge; three of seven studies showing effects in favour of an exercise intervention benefiting physical performance; and three

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of five studies showing effects in favour of a multidisciplinary intervention reducing length of hospital stay. The results of Kosse 2013 appear similar to this review, in that there is considerable uncertainty regarding the effect of exercise on functional and hospital outcomes.

The narrative review of Martínez-Velilla 2016 found inconsistent results for functional improvement at the time of discharge from hospital, but did conclude that the mean length of stay was reduced for participants in multidisciplinary interventions. The narrative review of Kanach 2018 focused exclusively on structured exercise interventions, excluding exercise prescribed as a component of a multidisciplinary intervention. The authors concluded that they were able to add little to the conclusions of de Morton 2007a, in that they found evidence of the effectiveness of exercise interventions to be inconsistent. The findings of both Martínez-Velilla 2016 and Kanach 2018 appear in keeping with this review.

The meta-analysis of Valenzuela 2020 had similar aims to this review, though had stricter definitions of what constituted an exercise intervention, and included non-general medical populations (e.g. respiratory and cardiac-specific populations) and studies that randomised at any point during hospitalisation (as opposed to the criterion of this current review of requiring randomisation within the first 72 hours after hospital admission). Most results are in keeping with this review. The authors concluded that there was no evidence that, compared to usual care, exercise interventions reduced length of hospital stay, or affected the risk of readmission or mortality. They found that participants who received an exercise intervention were likely to have greater independence with ADL at discharge (SMD 0.64, 95% CI 0.19 to 1.08; 5 trials, 870 participants) and a higher level of physical performance at discharge (SMD 0.57, 95% CI 0.18 to 0.95; 7 trials, 1052 participants) than those who received usual care. The effect size estimates were more favourable to the exercise intervention than were the estimates in this review. Nevertheless, in keeping with our findings, the reported CIs include meaningful benefit and non-meaningful benefit when analysed using the estimates of MCID applied in this review.

The review of Reynolds 2021 investigated the effect of unstructured mobility interventions in hospitalised older adults. With similar findings to this current review, the authors concluded that although the interventions may have improved physical activity and function during hospitalisation there was low certainty of evidence.

In summary, we do not believe that our findings are significantly different from other reviews, and although some individual studies show meaningful benefit, this does not translate to a high certainty of evidence when the studies are pooled. Investigating the causes of the inconsistencies observed in all of the above reviews could be a focus of future research.

AUTHORS' CONCLUSIONS

Implications for practice

This review update including 24 studies with 7511 participants showed that exercise may make little difference to independence in activities of daily living or quality of life. We are uncertain about the effect of exercise on functional mobility, incidence of delirium and medical deterioration. Certainty of evidence was limited by risk of bias, imprecision and inconsistency. Whilst some individual studies showed appreciable benefits of exercise interventions for older adults during an acute hospitalisation, when we pool the evidence and assessed the certainty of evidence, there is insufficient certainty of evidence to inform change to routine clinical practice. Importantly, there is moderate-certainty evidence that exercise interventions in hospitals do not increase falls during hospitalisation, and this should, therefore, not be a barrier to their implementation. We suggest that clinicians continue to rely on their assessments and clinical reasoning to tailor exercise interventions to patients' needs and preferences.

Implications for research

There is uncertainty regarding the effect of exercise interventions during an acute hospitalisation on functional and hospital outcomes in older medical inpatients. Some studies have provided positive findings, but the reasons for this positive deviance remain unclear. Differences in populations, settings and intervention design may be responsible. Future primary research on the effect of exercise on acute hospitalisation could focus on more consistent and uniform reporting of participant's characteristics including their baseline level of functional ability, as well as exercise dose, intensity and adherence that may provide an insight into the reasons for the observed inconsistencies in findings. Further, underpinning future studies of exercise efficacy with qualitative evaluation and process evaluations may assist efforts to replicate the more successful studies.

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REFERENCES

References to studies included in this review

Abizanda 2011 *{published data only}*

Abizanda P, Leon M, Dominguez-Martin L, Lozano-Berrio V, Romero L, Luengo C, et al. Effects of a short-term occupational therapy intervention in an acute geriatric unit. A randomized clinical trial. *Maturitas* 2011;**69**(3):273-8.

Asplund 2000 *{published data only}*

* Asplund K, Gustafson Y, Jacobsson C, Bucht G, Wahlin A, Peterson J, et al. Geriatric-based versus general wards for older acute medical patients: a randomized comparison of outcomes and use of resources. *Journal of the American Geriatrics Society* 2000;**48**:1381-8.

Blanc-Bisson 2008 *{published data only}*

Blanc-Bisson C, Dechamps A, Gouspillou G, Dehail P, Bourdel-Marchasson I. A randomized controlled trial on early physiotherapy intervention versus usual care in acute care unit for elderly: potential benefits in light of dietary intakes. *Journal of Nutrition, Health and Aging* 2008;**12**(6):395-9.

Brown 2016 *{published data only}*

Brown CJ, Foley KT, Lowman JD, MacLennan PA, Razjouyan J, Najafi B, et al. Comparison of posthospitalization function and community mobility in hospital mobility program and usual care patients a randomized clinical trial. *JAMA Internal Medicine* 2016;**176**(7):921-7.

Counsell 2000 *{published data only}*

Counsell SR, Holder CM, Liebenauer LL, Palmer RM, Fortinsky RH, Kresevic DM, et al. Effects of a multicomponent intervention on functional outcomes and process of care in hospitalized older patients: a randomized controlled trial of Acute Care for Elders (ACE) in a community hospital. *Journal of the American Geriatrics Society* 2000;**48**(12):1572-81.

Courtney 2009 *{published data only}*

* Courtney M, Edwards H, Chang A, Parker A, Finlayson K, Hamilton K. Fewer emergency readmissions and better quality of life for older adults at risk of hospital readmission: a randomized controlled trial to determine the effectiveness of a 24-week exercise and telephone follow-up program. *Journal of the American Geriatrics Society* 2009;**57**(3):395-402.

Courtney MD, Edwards HE, Chang AM, Parker AW, Finlayson K, Bradbury C, et al. Improved functional ability and independence in activities of daily living for older adults at high risk of hospital readmission: a randomized controlled trial. *Journal of Evaluation in Clinical Practice* 2012;**18**(1):128-34.

Graves N, Courtney M, Edwards H, Chang A, Parker A, Finlayson K. Cost-effectiveness of an intervention to reduce emergency re-admissions to hospital among older patients. *PLOS One* 2009;**4**(10):e7455.

de Morton 2007 *{published data only}*

de Morton NA, Keating JL, Berlowitz DJ, Jackson B, Lim WK. Additional exercise does not change hospital or patient outcomes in older medical patients: a controlled clinical trial. *Australian Journal of Physiotherapy* 2007;**53**(2):105-11.

Ekerstad 2017 *{published data only}*

Åhlund K, Bäck M, Öberg B, Ekerstad N. Effects of comprehensive geriatric assessment on physical fitness in an acute medical setting for frail elderly patients. *Clinical Interventions in Aging* 2017;**12**:1929-39.

Ekerstad N, Ivanoff SD, Landahl S, Ostberg G, Johansson M, Andersson D, et al. Acute care of severely frail elderly patients in a CGA-unit is associated with less functional decline than conventional acute care. *Clinical Interventions in Aging* 2017;**12**:1239-49.

* Ekerstad N, Karlson BW, Dahlin Ivanoff S, Landahl S, Andersson D, Heintz E, et al. Is the acute care of frail elderly patients in a comprehensive geriatric assessment unit superior to conventional acute medical care? *Clinical Interventions in Aging* 2017;**12**:1-9.

Fretwell 1990 *{published data only}*

Fretwell MD, Raymond PM, McGarvey ST, Owens N, Traines M, Silliman RA, et al. The Senior Care Study. A controlled trial of a consultative/unit-based geriatric assessment program in acute care. *Journal of the American Geriatrics Society* 1990;**38**(10):1073-81.

Gazineo 2021 *{published and unpublished data}*

Gazineo D, Godino L, Decaro R, Calogero P, Pinto D, Chiari P, et al. Assisted walking program on walking ability in in-hospital geriatric patients: a randomized trial. *Journal of the American Geriatrics Society* 2021;**69**(3):637-43.

Hu 2020 *{published data only}*

Hu F-W, Huang Y-T, Lin H-S, Chen C-H, Chen M-J, Chang C-M. Effectiveness of a simplified reablement program to minimize functional decline in hospitalized older patients. *Geriatrics & Gerontology International* 2020;**20**(5):436-42.

Jeffs 2013 *{published and unpublished data}*

Jeffs KJ, Berlowitz DJ, Grant S, Lawlor V, Graco M, De Morton NA, et al. An enhanced exercise and cognitive programme does not appear to reduce incident delirium in hospitalised patients: a randomised controlled trial. *BMJ Open* 2013;**3**(6):e002569.

Jones 2006 *{published data only}*

Jones CT, Lowe AJ, MacGregor L, Brand CA, Tweddle N, Russell DM. A randomised controlled trial of an exercise intervention to reduce functional decline and health service utilisation in the hospitalised elderly. *Australasian Journal on Ageing* 2006;**25**(3):126-33.

Killey 2006 *{published data only (unpublished sought but not used)}*

Killey B, Watt E. The effect of extra walking on the mobility, independence and exercise self-efficacy of elderly hospital in-patients: a pilot study. *Contemporary Nurse* 2006;**22**(1):120-33.

Copyright © 2022 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

Landefeld 1995 *{published data only}*

Covinsky KE, King JT, Quinn LM, Siddique R, Palmer R, Kresevic DM, et al. Do acute care for elders units increase hospital costs? A cost analysis using the hospital perspective. *Journal of the American Geriatrics Society* 1997;**45**(6):729-34.

* Landefeld CS, Palmer RM, Kresevic DM, Fortinsky RH, Kowal J. A randomized trial of care in a hospital medical unit especially designed to improve the functional outcomes of acutely ill older patients. *New England Journal of Medicine* 1995;**332**(20):1338-44.

Martinez-Velilla 2019 *{published and unpublished data}*

Anonymous. Correction: effect of exercise intervention on functional decline in very elderly patients during acute hospitalization: a randomized clinical trial (JAMA Internal Medicine (2018) DOI: 10.1001/jamainternmed.2018.4869). *JAMA Internal Medicine* 2019;**179**(1):127.

Martínez-Velilla N, Sáez de Asteasu L, Ramírez-Vélez R, Zambom-Ferraresi F, García-Hermoso A, Izquierdo M. Recovery of the decline in activities of daily living after hospitalization through an individualized exercise programme: secondary analysis of a randomized clinical trial. *Journals of Gerontology: Series A* 2021;**76**(8):1519–23.

* Martinez-Velilla N, Casas-Herrero A, Zambom-Ferraresi F, Lopez Saez de Asteasu M, Lucia A, Galbete A, et al. Effect of exercise intervention on functional decline in very elderly patients during acute hospitalization: a randomized clinical trial. *JAMA Internal Medicine* 2019;**179**(1):28-36.

Martinez-Velilla N, Valenzuela PL, Saez de Asteasu ML, Zambom-Ferraresi F, Ramirez-Velez R, Garcia-Hermoso A, et al. Effects of a tailored exercise intervention in acutely hospitalized diabetic oldest old adults: an ancillary analysis. *Journal of Clinical Endocrinology and Metabolism* 2020;**106**(2):e899-906.

Sáez de Asteasu ML, Martinez-Velilla N, Zambom-Ferraresi F, Casas-Herrero A, Cadore EL, Galbete A, et al. Assessing the impact of physical exercise on cognitive function in older medical patients during acute hospitalization: secondary analysis of a randomized trial. *PLOS Medicine* 2019;**16**(7):e1002852.

Sáez de Asteasu ML, Martinez-Velilla N, Zambom-Ferraresi F, Ramirez-Velez R, Garcia-Hermoso A, Cadore EL, et al. Changes in muscle power after usual care or early structured exercise intervention in acutely hospitalized older adults. *Journal of Cachexia, Sarcopenia and Muscle* 2020;**11**(4):997-1006.

Sáez de Asteasu ML, Martinez-Velilla N, Zambom-Ferraresi F, Ramirez-Velez R, Garcia-Hermoso A, Izquierdo M. Cognitive function improvements mediate exercise intervention effects on physical performance in acutely hospitalized older adults. *Journal of the American Medical Directors Association* 2020;**22**(4):787-91.

Saez de Asteasu ML, Martinez-Velilla N, Zambom-Ferraresi F, Casas-Herrero A, Cadore EL, Ramirez-Velez R, et al. Changes in muscle power after usual care or early structured exercise intervention in acutely hospitalized older adults. *Journal of Cachexia, Sarcopenia and Muscle* 2019;**10**(6):1266-75.

Saez de Asteasu ML, Martinez-Velilla N, Zambom-Ferraresi F, Casas-Herrero A, Lucia A, Galbete A, et al. Physical exercise improves function in acutely hospitalized older patients: secondary analysis of a randomized clinical trial. *Journal of the American Medical Directors Association* 2019;**20**(7):866-73.

McCullagh 2020 *{published and unpublished data}*

McCullagh R, O'Connell E, O'Meara S, Dahly D, O'Reilly E, O'Connor K, et al. Augmented exercise in hospital improves physical performance and reduces negative post hospitalization events: a randomized controlled trial. *BMC Geriatrics* 2020;**20**(1):46.

McGowan 2018a *{published data only}*

McGowan T, Ong T, Kumar A, Lunt E, Sahota O. The effect of chair-based pedal exercises for older people admitted to an acute hospital compared to standard care: a feasibility study. *Age and Ageing* 2018;**47**(3):483-6.

Mudge 2008 *{published data only}*

Mudge AM, Giebel AJ, Cutler AJ. Exercising body and mind: an integrated approach to functional independence in hospitalized older people. *Journal of the American Geriatrics Society* 2008;**56**(4):630-5.

Ortiz-Alonso 2020 *{published data only}*

* Ortiz-Alonso J, Bustamante-Ara N, Valenzuela PL, Vidan-Astiz M, Rodriguez-Romo G, Mayordomo-Cava J, et al. Effect of a simple exercise program on hospitalization-associated disability in older patients: a randomized controlled trial. *Journal of the American Medical Directors Association* 2020;**21**(4):531-7.e1.

Valenzuela PL, Ortiz-Alonso J, Bustamante-Ara N, Vidán MT, Rodríguez-Romo G, Mayordomo-Cava J, et al. Individual responsiveness to physical exercise intervention in acutely hospitalized older adults. *Journal of Clinical Medicine* 2020;**9**(3):797.

Pedersen 2019 *{published and unpublished data}*

Pedersen MM, Petersen J, Beyer N, Larsen Helle G-J, Jensen PS, Andersen O, et al, STAND-Cph Collaborative Group. A randomized controlled trial of the effect of supervised progressive cross-continuum strength training and protein supplementation in older medical patients: the STAND-Cph trial. *Trials* 2019;**20**(1):655.

Sahota 2017 *{published data only}*

Sahota O, Pulikottil-Jacob R, Marshall F, Montgomery A, Tan W, Sach T, et al. The Community In-reach Rehabilitation and Care Transition (CIRACT) clinical and cost-effectiveness randomisation controlled trial in older people admitted to hospital as an acute medical emergency. *Age and Ageing* 2017;**46**(1):26-32.

Slaets 1997 *{published data only (unpublished sought but not used)}*

Slaets JP, Kauffmann RH, Duivenvoorden HJ, Pelemans W, Schudel WJ. A randomized trial of geriatric liaison intervention in elderly medical inpatients. *Psychosomatic Medicine* 1997;**59**(6):585-91.

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Zelada 2009 *{published data only (unpublished sought but not used)}*

Zelada MA, Salinas R, Baztan JJ. Reduction of functional deterioration during hospitalization in an acute geriatric unit. *Archives of Gerontology and Geriatrics* 2009;**48**(1):35-9.

References to studies excluded from this review

Ahn 2018 *{published data only}*

Ahn JY, Song JE, Ann HW, Jeon Y, Ahn MY, Jung IY, et al. Effects of early exercise rehabilitation on functional recovery in patients with severe sepsis. *Yonsei Medical Journal* 2018;**59**(7):843-51.

Barnes 2012 *{published data only}*

Barnes DE, Palmer RM, Kresevic DM, Fortinsky RH, Kowal J, Chren M-M, et al. Acute care for elders units produced shorter hospital stays at lower cost while maintaining patients' functional status. *Health Affairs* 2012;**31**(6):1227-36.

Braun 2019 *{published data only}*

Braun T, Gruneberg C, Susmilch K, Wiessmeier M, Schwenk I, Eggert S, et al. An augmented prescribed exercise program (APEP) to improve mobility of older acute medical patients – a randomized, controlled pilot and feasibility trial. *BMC Geriatrics* 2019;**19**(1):240.

Brown 2006 *{published data only}*

Brown CJ, Peel C, Bamman MM, Allman RM. Exercise program implementation proves not feasible during acute care hospitalization. *Journal of Rehabilitation Research and Development* 2006;**43**(7):939-46.

Bruun 2020 *{published data only}*

Bruun IH, Maribo T, Norgaard B, Schiottz-Christensen B, Jessen MG, Mogensen CB. The effect of systematic functional assessment and immediate rehabilitation on physical performance in acutely admitted older adults with reduced functional performance: a randomised clinical trial. *BMJ Open* 2020;**42**(1):53-62.

Buhl 2016 *{published data only}*

Buhl SF, Andersen AL, Andersen JR, Andersen O, Jensen JE, Rasmussen AM, et al. The effect of protein intake and resistance training on muscle mass in acutely ill old medical patients – a randomized controlled trial. *Clinical Nutrition* 2016;**35**(1):59-66.

Collard 1985 *{published data only}*

Collard AF, Bachman SS, Beatrice DF. Acute care delivery for the geriatric patient: an innovative approach. *QRB – Quality Review Bulletin* 1985;**11**(6):180-5.

Cumming 2008 *{published data only}*

Cumming RG, Sherrington C, Lord SR, Simpson JM, Vogler C, Cameron ID, et al. Cluster randomised trial of a targeted multifactorial intervention to prevent falls among older people in hospital. *BMJ (Clinical Research Ed.)* 2008;**336**(7647):758-60.

DRKS00011262 *{published data only}*

DRKS00011262. Feasibility and effectiveness of an augmented prescribed exercise programme (APEP) on mobility in older medical patients in the acute setting – a randomised pilot study. www.drks.de/drks_web/navigate.do?navigationId=trial.HTML&TRIAL_ID=DRKS00011262 (first received 27 October 2016).

Fleck 2012 *{published data only}*

Fleck SJ, Bustamante-Ara N, Ortiz J, Vidán M-T, Lucia A, Serra-Rexach JA. Activity in GEriatric acute CARe (AGECAR): rationale, design and methods. *BMC Geriatrics* 2012;**12**(1):28.

Fleiner 2017 *{published data only}*

Fleiner T, Dauth H, Gersie M, Zijlstra W, Haussermann P. Structured physical exercise improves neuropsychiatric symptoms in acute dementia care: a hospital-based RCT. *Alzheimer's Research & Therapy* 2017;**9**(1):68.

Gade 2019 *{published data only}*

Gade J, Beck AM, Andersen HE, Christensen B, Ronholt F, Klausen TW, et al. Protein supplementation combined with low-intensity resistance training in geriatric medical patients during and after hospitalization: a randomized, double-blind, multicenter trial. *British Journal of Nutrition* 2019;**112**(9):1006-20.

Greening 2014 *{published data only}*

Greening NJ, Williams JE, Hussain SF, Harvey-Dunstan TC, Bankart MJ, Chaplin EJ, et al. An early rehabilitation intervention to enhance recovery during hospital admission for an exacerbation of chronic respiratory disease: randomised controlled trial. *BMJ* 2014;**349**:g4315.

Haines 2004 *{published data only}*

Haines TP, Bennell KL, Osborne RH, Hill KD. Effectiveness of targeted falls prevention programme in subacute hospital setting: randomised controlled trial. *BMJ* 2004;**328**(7441):676-9.

Haines 2007 *{published data only}*

Haines TP, Hill KD, Bennell KL, Osborne RH. Additional exercise for older subacute hospital inpatients to prevent falls: benefits and barriers to implementation and evaluation. *Clinical Rehabilitation* 2007;**21**(8):742-53.

Hamilton 2018 *{published data only}*

Hamilton AC, Stilphen M, Hu B, Jacqueline F, Hartley J, Rothberg M. Dedicated ambulator-assisted physical activity to improve hospital outcome measures in elderly medical inpatients: a randomized controlled trial. *Hospital Medicine* 2018:Abstract 124.

Hamilton 2019 *{published data only}*

Hamilton AC, Lee N, Stilphen M, Hu B, Schramm S, Frost F, et al. Increasing mobility via in-hospital ambulation protocol delivered by mobility technicians: a pilot randomized controlled trial. *Journal of Hospital Medicine* 2019;**14**(5):272-7.

Harris 1991 *{published data only}*

Harris RD, Henschke PJ, Popplewell PY, Radford AJ, Bond MJ, Turnbull RJ, et al. A randomised study of outcomes in a defined group of acutely ill elderly patients managed in a geriatric assessment unit or a general medical unit. *Australian and New Zealand Journal of Medicine* 1991;**21**(2):230-4.

Copyright © 2022 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

Hegerova 2015 *{published data only}*

Hegerova P, Dedkova Z, Sobotka L. Early nutritional support and physiotherapy improved long-term self-sufficiency in acutely ill older patients. *Nutrition* 2015;**31**(1):166-70.

Heim 2017 *{published data only}*

Heim N, van Stel HF, Ettema RG, van der Mast RC, Inouye SK, Schuurmans MJ. HELP! Problems in executing a pragmatic, randomized, stepped wedge trial on the Hospital Elder Life Program to prevent delirium in older patients. *Trials* 2017;**18**(1):220.

Hochstetter 2005 *{published data only}*

Hochstetter JK, Lewis J, Soares-Smith L. An investigation into the immediate impact of breathlessness management on the breathless patient: randomised controlled trial. *Physiotherapy* 2005;**91**(3):178-85.

José 2016 *{published data only}*

José A, Dal Corso S. Inpatient rehabilitation improves functional capacity, peripheral muscle strength and quality of life in patients with community-acquired pneumonia: a randomised trial. *Journal of Physiotherapy* 2016;**62**(2):96-102.

JPRN-UMIN000019551 *{published data only}*

JPRN-UMIN000019551. Effects of acute phase intensive electrical muscle stimulation in frail elderly patients with acute decompensated heart failure: the ACTIVE-EMS Randomized Controlled Trial. trialsearch.who.int/Trial2.aspx?TrialID=JPRN-UMIN000019551 (first received 28 October 2015).

JPRN-UMIN000030036 *{published data only}*

JPRN-UMIN000030036. Effects of movement velocity training of upper limbs on the mobility in frail elderly. trialsearch.who.int/Trial2.aspx?TrialID=JPRN-UMIN000030036 (first received 27 November 2017).

Kim 2013 *{published data only}*

Kim S, Yuk G-C, Gak H. Effects of the horse riding simulator and ball exercises on balance of the elderly. *Journal of Physical Therapy Science* 2013;**25**(11):1425-8.

Kirk 2018 *{published data only}*

Kirk JW, Bodilsen AC, Tjornhoj-Thomsen T, Pedersen MM, Bandholm T, Husted RS, et al. A tailored strategy for designing the Walk-Copenhagen (WALK-Cph) intervention to increase mobility in hospitalised older medical patients: a protocol for the qualitative part of the WALK-Cph project. *BMJ Open* 2018;**8**(3):e020272.

Latham 2001 *{published data only}*

Latham NK, Stretton C, Ronald M. Progressive resistance strength training in hospitalised older people: a preliminary investigation. *Journal of Physiotherapy* 2001;**29**(2):41-8.

Lopez-Lopez 2019 *{published data only}*

Lopez-Lopez L, Torres-Sanchez I, Rodriguez-Torres J, Cabrera-Martos I, Ortiz-Rubio A, Valenza MC. Does adding an integrated physical therapy and neuromuscular electrical stimulation therapy to standard rehabilitation improve functional outcome in elderly patients with pneumonia? A randomised controlled trial. *Clinical Rehabilitation* 2019;**33**(11):1757-66.

Mallery 2003 *{published data only}*

Mallery LH, MacDonald EA, Hubley-Kozey CL, Earl ME, Rockwood K, MacKnight C. The feasibility of performing resistance exercise with acutely ill hospitalized older adults. *BMC Geriatrics* 2003;**3**(3):1-8.

Martinez-Velilla 2017 *{published data only}*

Martinez-Velilla N, Casas-Herrero A, Lopez Saez De Asteasu M, Zambon Ferraresi F, Gutierrez-Valencia M, Amu Ruiz F, et al. Can we modify the functional and cognitive trajectory in a hospital with exercise? A randomized clinical trial. *European Geriatric Medicine* 2017;**8**(Suppl 1):S146.

McGowan 2018b *{published data only}*

McGowan T, Ong T, Kumar A, Lunt E, Sahota O. The effect of chair-based pedal exercises for older people admitted to hospital: a feasibility study. *Age and Ageing* 2018;**47**(Suppl 2):ii9–ii11.

Mills 2019 *{published data only (unpublished sought but not used)}*

Mills LG, Roberson M, Dalton T. Evaluating the effect of mobilizing geriatric inpatients on length of stay. *Journal of the American Geriatrics Society* 2019;**67**(Suppl 1):S293.

Mudge 2007 *{published data only}*

Mudge A, Cutler A, Geibel A. Exercising body and mind: an integrated approach to functional independence in acutely hospitalised older people. *Internal Medicine Journal* 2007;**37**(Suppl 3):A73.

Mudge 2019 *{published data only}*

Mudge AM, McRae P, Barnett A, Inouye S. Reducing hospital associated complications in older people: results from the cherish cluster randomised controlled study. *Journal of the American Geriatrics Society* 2019;**67**(Suppl 1):S142.

Mundy 2003 *{published data only}*

Mundy LM, Leet TL, Darst K, Schnitzler MA, Dunagan WC. Early mobilization of patients hospitalized with community-acquired pneumonia. *Chest* 2003;**124**(3):883-9.

NCT00038155 *{published data only}*

NCT00038155. Rehabilitation for older adults from acute medical conditions. clinicaltrials.gov/ct2/show/NCT00038155 (first received 30 May 2002).

NCT01483456 *{published data only}*

NCT01483456. Impact of multidisciplinary program on falls in elderly inpatients. clinicaltrials.gov/ct2/show/NCT01483456 (first received 1 December 2011).

NCT02062541 *{published data only}*

NCT02062541. Effect of functional assessment and immediate rehabilitation of ED admitted elderly with reduced functional performance. www.clinicaltrials.gov/ct2/show/NCT02062541 (first received 13 February 2014).

Copyright © 2022 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

NCT03558841 *{published data only}*

NCT03558841. Effect of lyra gait training on the mobility of geriatric rehabilitation inpatients. clinicaltrials.gov/ct2/show/NCT03558841 (first received 15 June 2018).

NCT04565626 *{published data only}*

NCT04565626. Impact of additional unsupervised peddle bike physiotherapy on acutely hospitalized medicine inpatients. clinicaltrials.gov/ct2/show/NCT04565626 (first received 25 September 2020).

Netz 1994 *{published data only}*

Netz Y, Yaretzki A, Salganik I, Jacob T, Finkeltov B, Argov E. The effect of supervised physical activity on cognitive and affective state of geriatric and psychogeriatric in-patients. *Clinical Gerontologist* 1994;**15**(1):47-56.

Neumeier 2017 *{published data only}*

Neumeier A, Nordon-Craft A, Malone D, Schenkman M, Clark B, Moss M. Prolonged acute care and post-acute care admission and recovery of physical function in survivors of acute respiratory failure: a secondary analysis of a randomized controlled trial. *Critical Care* 2017;**21**(1):190.

O'Shaughnessy 2019 *{published data only}*

O'Shaughnessy I, White S, Smalle E, Cassarino M, Robinson K, Quinn R, et al. Optimising early assessment and intervention by health and social care professions in the ED: preliminary findings from the OPTIMEND RCT. *Age and Ageing* 2019;**48**(Suppl 3):iii1–iii16.

Peel 2016 *{published data only}*

Peel NM, Paul SK, Cameron ID, Crotty M, Kurrle SE, Gray LC. Promoting activity in geriatric rehabilitation: a randomized controlled trial of accelerometry. *PLOS One* 2016;**11**(8):e0160906.

Peyrusqué 2021 *{published data only}*

Peyrusqué E, Kergoat M-J, Bolduc A, Buckinx F, Law C, Veillette N, et al. Maintenance of Autonomy Through exerCise in Hospital setting (MATCH): a feasibility study. *Journal of the American Medical Directors Association* 2021;**22**(4):873-5.

Pires 2020 *{published data only}*

Pires PR, Trombert V, Poncet A, Kizlik J, Gold G, Ehret G, et al. Feasibility and safety of high-intensity interval training for the rehabilitation of geriatric inpatients (HIITERGY): a pilot randomized study. *BMC Geriatrics* 2020;**20**(1):197.

Pitkala 2006 *{published data only}*

Pitkala KH, Laurila JV, Strandberg TE, Tilvis RS. Multicomponent geriatric intervention for elderly inpatients with delirium: a randomized, controlled trial. *Journals of Gerontology: Series A* 2006;**61**(2):176-81.

Raymond 2017 *{published data only}*

Raymond MJ, Jeffs KJ, Winter A, Soh S-E, Hunter P, Holland AE. The effects of a high-intensity functional exercise group on clinical outcomes in hospitalised older adults: an assessor-blinded, randomised controlled trial. *Age and Ageing* 2017;**46**(2):208-14.

Rodrigues 2019 *{published data only}*

Rodrigues C, Mendonça D, Martins MM. Effects of a nursing care program on functional outcomes in older acute medical in-patients: protocol for a randomized controlled trial. *Porto Biomedical Journal* 2019;**4**(2):e24.

Rubenstein 1984 *{published data only}*

Rubenstein LZ, Josephson KR, Wieland GD, English PA, Sayre JA, Kane RL. Effectiveness of a geriatric evaluation unit. A randomized clinical trial. *New England Journal of Medicine* 1984;**311**(26):1664-70.

Sáez de Asteasu 2021b *{published data only}*

Sáez de Asteasu ML, Martínez-Velilla N, Zambom-Ferraresi F, Ramírez-Vélez R, García-Hermoso A, Cadore EL, et al. Exercise effects on brain and muscle function in acutely hospitalized older patients assessed by functional near-infrared spectroscopy. *Journal of the American Medical Directors Association* 2021;**22**(4):875-6.

Said 2012 *{published data only}*

Said CM, Morris ME, Woodward M, Churilov L, Bernhardt J. Enhancing physical activity in older adults receiving hospital based rehabilitation: a phase II feasibility study. *BMC Geriatrics* 2012;**12**:26.

Saltvedt 2002 *{published data only}*

Saltvedt I, Mo ES, Fayers P, Kaasa S, Sletvold O. Reduced mortality in treating acutely sick, frail older patients in a geriatric evaluation and management unit. A prospective randomized trial. *Journal of the American Geriatrics Society* 2002;**50**(5):792-8.

Saltvedt 2004 *{published data only}*

Saltvedt I, Saltnes T, Opdahl Mo ES, Fayers P, Kaasa S, Sletvold O. Acute geriatric intervention increases the number of patients able to live at home. A prospective randomized study. *Aging Clinical and Experimental Research* 2004;**16**(4):300-6.

Saltvedt 2006 *{published data only}*

Saltvedt I, Jordhoy M, Mo ES, Fayers P, Kaasa S, Sletvold O. Randomised trial of in-hospital geriatric intervention: impact on function and morale. *Gerontology* 2006;**52**(4):223-30.

Schwenk 2014 *{published data only}*

Schwenk M, Dutzi I, Englert S, Micol W, Najafi B, Mohler J, et al. An intensive exercise program improves motor performances in patients with dementia: translational model of geriatric rehabilitation. *Journal of Alzheimer's Disease* 2014;**39**(3):487-98.

Seo 2019 *{published data only}*

Seo K-H, Sin D, Ju EP, Lim J-Y. Effects of whole body vibration training using side-alternating vibration platform with tilt table in hospitalized older adults with sarcopenia: a randomized controlled pilot study. *Age and Ageing* 2019;**48**(S4):iv18–iv27.

Siebens 2000 *{published data only}*

Siebens H, Aronow H, Edwards D, Ghasemi Z. A randomized controlled trial of exercise to improve outcomes of acute hospitalization in older adults. *Journal of the American Geriatrics Society* 2000;**48**(12):1545-52.

Copyright © 2022 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

Steadman 2003 *{published data only}*

Steadman J, Donaldson N, Kalra L. A randomized controlled trial of an enhanced balance training program to improve mobility and reduce falls in elderly patients. *Journal of the American Geriatrics Society* 2003;**51**(6):847-52.

Steunenberg 2016 *{published data only}*

Steunenberg B, van der Mast R, Strijbos MJ, Inouye SK, Schuurmans MJ. How trained volunteers can improve the quality of hospital care for older patients. A qualitative evaluation within the Hospital Elder Life Program (HELP). *Geriatric Nursing* 2016;**37**(6):458-63.

Sullivan 2007 *{published data only}*

Sullivan DH, Roberson PK, Smith ES, Price JA, Bopp MM. Effects of muscle strength training and megestrol acetate on strength, muscle mass, and function in frail older people. *Journal of the American Geriatrics Society* 2007;**55**(1):20-8.

Tibaek 2014 *{published data only}*

Tibaek S, Andersen CW, Pedersen SF, Rudolf KS. Does progressive resistance strength training as additional training have any measured effect in older hospitalised patients? A single-blinded randomized controlled trial. *Clinical Rehabilitation* 2014;**28**(4):319-28.

Timonen 2002 *{published data only}*

Timonen L, Rantanen T, Timonen TE, Sulkava R. Effects of a group-based exercise program on the mood state of frail older women after discharge from hospital. *International Journal of Geriatric Psychiatry* 2002;**17**(12):1106-11.

Timonen 2006 *{published data only}*

Timonen L, Rantanen T, Makinen E, Timonen TE, Tormakangas T, Sulkava R. Effects of a group-based exercise program on functional abilities in frail older women after hospital discharge. *Aging Clinical and Experimental Research* 2006;**18**(1):50-6.

Treacy 2015a *{published data only}*

Treacy D, Schurr K, Lloyd B, Sherrington C. Additional standing balance circuit classes during inpatient rehabilitation improved balance outcomes: an assessor-blinded randomised controlled trial. *Physiotherapy* 2015;**44**(4):580-6.

Treacy 2015b *{published data only}*

Treacy D, Schurr K, Lloyd B, Sherrington C. Additional standing balance circuit classes during inpatient rehabilitation improved balance outcomes: an assessor blinded randomised controlled trial. *Age and Ageing* 2015;**101**(Suppl 1):eS1533-4.

Trombetti 2013 *{published data only}*

Trombetti A, Hars M, Herrmann F, Rizzoli R, Ferrari S. Effect of a multifactorial fall-and-fracture risk assessment and management program on gait and balance performances and disability in hospitalized older adults: a controlled study. *Osteoporosis International* 2013;**24**(3):867-76.

Vidan 2009 *{published data only}*

Vidan MT, Sanchez E, Alonso M, Montero B, Ortiz J, Serra JA. An intervention integrated into daily clinical practice reduces the incidence of delirium during hospitalization in elderly patients. *Journal of the American Geriatrics Society* 2009;**57**(11):2029-36.

Weatherall 2004 *{published data only}*

Weatherall M. A targeted falls prevention programme plus usual care significantly reduces falls in elderly people during hospital stays. *Evidence-Based Healthcare and Public Health* 2004;**8**(5):273-5.

Yoo 2013 *{published data only}*

Yoo JW, Nakagawa S, Kim S. Delirium and transition to a nursing home of hospitalized older adults: a controlled trial of assessing the interdisciplinary team-based "geriatric" care and care coordination by non-geriatrics specialist physicians. *Geriatrics & Gerontology International* 2013;**13**(2):342-50.

References to studies awaiting assessment

Kojaie-Bidgoli 2021 *{published data only}*

Kojaie-Bidgoli A, Sharifi F, Maghsoud F, Alizadeh-Khoei M, Jafari F, Sadeghi F. The Modified Hospital Elder Life Program (HELP) in geriatric hospitalized patients in internal wards: a double-blind randomized control trial. *BMC Geriatrics* 2021;**21**(1):599. [PMID: 34702164]

References to ongoing studies

NCT03604640 *{published data only}*

NCT03604640. Physical training and health education in hospitalized elderly. clinicaltrials.gov/ct2/show/NCT03604640 (first received 27 July 2018).

NCT04600453 *{published data only}*

NCT04600453. Prevention of functional and cognitive impairment through a multicomponent exercise program. clinicaltrials.gov/ct2/show/NCT04600453 (first received 23 October 2020).

Additional references

Clegg 2013

Clegg A, Young J, Iliffe S, Rikkert MO, Rockwood K. Frailty in elderly people. *Lancet* 2013;**381**(9868):752-62.

Cole 2015

Cole MG, Bailey R, Bonnycastle M, McCusker J, Fung S, Ciampi A, et al. Partial and no recovery from delirium in older hospitalized adults: frequency and baseline risk factors. *Journal of the American Geriatrics Society* 2015;**63**(11):2340-8.

Covidence [Computer program]

Veritas Health Innovation Covidence. Melbourne, Australia: Veritas Health Innovation, accessed 20 May 2021. Available at covidence.org.

Covinsky 2011

Covinsky KE, Pierluissi E, Johnston CB. Hospitalization-associated disability: "she was probably able to ambulate, but I'm not sure". *JAMA* 2011;**306**(16):1782-93.

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Davydow 2013

Davydow DS, Hough CL, Levine DA, Langa KM, Iwashyna TJ. Functional disability, cognitive impairment, and depression after hospitalization for pneumonia. *American Journal of Medicine* 2013;**126**(7):615-24.e5.

Deeks 2022

Deeks JJ, Higgins JP, Altman DG. Chapter 10: Analysing data and undertaking meta-analyses. In: Higgins JP, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, et al, editor(s). Cochrane Handbook for Systematic Reviews of Interventions Version 6.3 (updated February 2022). Cochrane, 2022. Available from www.training.cochrane.org/handbook.

de Morton 2007b

de Morton NA, Jones CT, Keating JL, Berlowitz DJ, Lachlan DJ, MacGregor L, et al. The effect of exercise on outcomes for hospitalised older acute medical patients: an individual patient data meta-analysis. *Age and Ageing* 2007;**36**(2):219-22. [PMID: 17182667]

Falvey 2015

Falvey JR, Mangione KK, Stevens-Lapsley JE. Rethinking hospital-associated deconditioning: proposed paradigm shift. *Physical Therapy and Rehabilitation Journal* 2015;**95**(9):1307-15.

Fortinsky 1999

Fortinsky RH, Covinsky K, Palmer RM, Landefeld CS. Effects of functional status changes before and during hospitalization on nursing home admission of older adults. *Journals of Gerontology. Series A* 1999;**54**(10):M521-6.

Gill 2015

Gill TM, Gahbauer EA, Han L, Allore HG. The role of intervening hospital admissions on trajectories of disability in the last year of life: prospective cohort study of older people. *BMJ* 2015;**350**:h2361.

GRADEpro GDT [Computer program]

McMaster University (developed by Evidence Prime) GRADEpro GDT. Hamilton (ON): McMaster University (developed by Evidence Prime), accessed 3 March 2021. Available at gradepro.org.

Guyatt 2011

Guyatt GH, Oxman AD, Kunz R, Brozek J, Alonso-Coello P, Rind D, et al. GRADE guidelines 6. Rating the quality of evidence – imprecision. *Journal of Clinical Epidemiology* 2011;**64**(12):1283-93.

Hartley 2021

Hartley P, Romero-Ortuno R, Wellwood I, Deaton C. Changes in muscle strength and physical function in older patients during and after hospitalisation: a prospective repeated-measures cohort study. *Age and Ageing* 2021;**50**(1):153-60.

Heyn 2004

Heyn P, Abreu BC, Ottenbacher KJ. The effects of exercise training on elderly persons with cognitive impairment and dementia: a meta-analysis. *Archives of Physical Medicine and Rehabilitation* 2004;**85**(10):1694-704.

Higgins 2022a

Higgins JP, Savović J, Page MJ, Elbers RG, Sterne JA. Chapter 8: Assessing risk of bias in a randomized trial. In: Higgins JP, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, et al, editor(s). Cochrane Handbook for Systematic Reviews of Interventions Version 6.3 (updated February 2022). Cochrane, 2022. Available from www.training.cochrane.org/handbook. [PMID: 31462531]

Higgins 2022b

Higgins JP, Li T, Deeks JJ. Chapter 6: Choosing effect measures and computing estimates of effect. In: Higgins JP, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, et al, editor(s). Cochrane Handbook for Systematic Reviews of Interventions Version 6.3 (updated February 2022). Cochrane, 2022. Available from www.training.cochrane.org/handbook.

Hoffmann 2014

Hoffmann TC, Glasziou PP, Boutron I, Milne R, Perera R, Moher D, et al. Better reporting of interventions: Template for Intervention Description and Replication (TIDieR) checklist and guide. *BMJ* 2014;**348**:g1687. [DOI: 10.1136/bmj.g1687] [PMID: 24609605]

Hoyer 2014

Hoyer EH, Needham DM, Atanelov L, Knox B, Friedman M, Brotman DJ. Association of impaired functional status at hospital discharge and subsequent rehospitalization. *Journal of Hospital Medicine* 2014;**9**(5):277-82.

Inouye 2003

Inouye SK, Bogardus ST Jr, Williams CS, Leo-Summers L, Agostini JV. The role of adherence on the effectiveness of nonpharmacologic interventions: evidence from the Delirium Prevention Trial. *Archives of Internal Medicine* 2003;**163**(8):958-64.

Kanach 2018

Kanach FA, Pastva AM, Hall KS, Pavon JM, Morey MC. Effects of structured exercise interventions for older adults hospitalized with acute medical illness: a systematic review. *Journal of Aging and Physical Activity* 2018;**26**(2):284-303.

Kortebein 2008

Kortebein P, Symons TB, Ferrando A, Paddon-Jones D, Ronsen O, Protas E, et al. Functional impact of 10 days of bed rest in healthy older adults. *Journals of Gerontology. Series A* 2008;**63**(10):1076-81.

Kortebein 2009

Kortebein Patrick. Rehabilitation for hospital-associated deconditioning. *American Journal of Physical Medicine & Rehabilitation* 2009;**88**(1):66-77.

Kosse 2013

Kosse NM, Dutmer AL, Dasenbrock L, Bauer JM, Lamoth CJ. Effectiveness and feasibility of early physical rehabilitation programs for geriatric hospitalized patients: a systematic review. *BMC Geriatrics* 2013;**13**:107.

Copyright © 2022 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

Lafont 2011

Lafont C, Gérard S, Voisin T, Pahor M, Vellas B, The members of I A G G / A M P A Task Force. Reducing "iatrogenic disability" in the hospitalized frail elderly. *Journal of Nutrition, Health and Aging* 2011;**15**(8):645-60.

Liu 2009

Liu CJ, Latham NK. Progressive resistance strength training for improving physical function in older adults. *Cochrane Database of Systematic Reviews* 2009, Issue 3. Art. No: CD002759. [DOI: 10.1002/14651858.CD002759]

Loyd 2020

Loyd C, Markland AD, Zhang Y, Fowler M, Harper S, Wright NC, et al. Prevalence of hospital-associated disability in older adults: a meta-analysis. *Journal of the American Medical Directors Association* 2020;**21**(4):455-61.e5.

Lyons 2019

Lyons A, Romero-Ortuno R, Hartley P. Functional mobility trajectories of hospitalized older adults admitted to acute geriatric wards: a retrospective observational study in an English university hospital. *Geriatrics & Gerontology International* 2019;**19**(4):305-10.

Martínez-Velilla 2016

Martínez-Velilla N, Cadore EL, Casas-Herrero Á, Idoate-Saralegui F, Izquierdo M. Physical activity and early rehabilitation in hospitalized elderly medical patients: systematic review of randomized clinical trials. *Journal of Nutrition, Health & Aging* 2016;**20**(7):738-51.

McCusker 2001

McCusker J, Cole M, Dendukuri N, Belzile É, Primeau F. Delirium in older medical inpatients and subsequent cognitive and functional status: a prospective study. *Canadian Medical Association Journal* 2001;**165**(5):575.

Norman 2003

Norman GR, Sloan JA, Wyrwich KW. Interpretation of changes in health-related quality of life: the remarkable universality of half a standard deviation. *Medical Care* 2003;**41**(5):582-92.

Page 2022

Page MJ, Higgins JP, Sterne JA. Chapter 13: Assessing risk of bias due to missing results in a synthesis. In: Higgins JP, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, et al, editor(s). Cochrane Handbook for Systematic Reviews of Interventions Version 6.3 (updated February 2022). Cochrane 2022. Available from www.training.cochrane.org/handbook.

Perera 2006

Perera S, Mody SH, Woodman RC, Studenski SA. Meaningful change and responsiveness in common physical performance measures in older adults. *Journal of the American Geriatrics Society* 2006;**54**(5):743-9.

R [Computer program]

R Foundation for Statistical Computing R: A language and environment for statistical computing. Version 3.4.2. Vienna, Austria: R Foundation for Statistical Computing, 2017. Available at www.R-project.org. [URL: www.R-project.org/]

Review Manager Web [Computer program]

The Cochrane Collaboration Review Manager Web (RevMan Web). Version 4.12.0. The Cochrane Collaboration, 2022. Available at revman.cochrane.org.

Reynolds 2021

Reynolds CD, Brazier KV, Burgess EA, Golla JA, Le J, Parks BA, et al. Effects of unstructured mobility programs in older hospitalized general medicine patients: a systematic review and meta-analysis. *Journal of the American Medical Directors Association* 2021;**S1525-8610**(20):31057-4.

Schünemann 2022a

Schünemann HJ, Higgins JP, Vist GE, Glasziou P, Akl EA, Skoetz N, et al. Chapter 14: Completing 'Summary of findings' tables and grading the certainty of the evidence. In: Higgins JP, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, et al, editor(s). Cochrane Handbook for Systematic Reviews of Interventions Version 6.3 (updated February 2022). Cochrane, 2022. Available from www.training.cochrane.org/handbook.

Schünemann 2022b

Schünemann HJ, Vist GE, Higgins JP, Santesso N, Deeks JJ, Glasziou P, et al. Chapter 15: Interpreting results and drawing conclusions. In: Higgins JP, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, et al, editor(s). Cochrane Handbook for Systematic Reviews of Interventions Version 6.3 (updated February 2022). Cochrane, 2022. Available from www.training.cochrane.org/handbook.

Sourdet 2015

Sourdet S, Lafont C, Rolland Y, Nourhashemi F, Andrieu S, Vellas B. Preventable iatrogenic disability in elderly patients during hospitalization. *Journal of the American Medical Directors Association* 2015;**16**(8):674-81.

Tonkikh 2016

Tonkikh O, Shadmi E, Flaks-Manov N, Hoshen M, Balicer RD, Zisberg A. Functional status before and during acute hospitalization and readmission risk identification. *Journal of Hospital Medicine* 2016;**11**(9):636-41.

Valenzuela 2020

Valenzuela PL, Morales JS, Castillo-García A, Mayordomo-Cava J, García-Hermoso A, Izquierdo M, et al. Effects of exercise interventions on the functional status of acutely hospitalised older adults: a systematic review and meta-analysis. *Ageing Research Reviews* 2020;**61**:101076.

Viechtbauer 2010

Viechtbauer W. Conducting meta-analyses in R with the metafor package. *Journal of Statistical Software* 2010;**36**(3):1-48. [DOI: 10.18637/jss.v036.i03]

Welch 2018

Welch C, Hassan-Smith ZK, Greig CA, Lord JM, Jackson TA. Acute sarcopenia secondary to hospitalisation – an

Copyright © 2022 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

emerging condition affecting older adults. *Aging and Disease* 2018;**9**(1):151-64.

WHO 2020

World Health Organization. WHO guidelines on physical activity and sedentary behaviour. www.who.int/publications/i/item/9789240015128 (last accessed prior to 17 October 2022).

Zisberg 2015

Zisberg A, Shadmi E, Gur-Yaish N, Tonkikh O, Sinoff G. Hospital-associated functional decline: the role of hospitalization processes beyond individual risk factors. *Journal of the American Geriatrics Society* 2015;**63**(1):55-62.

References to other published versions of this review

de Morton 2006

de Morton NA, Keating JL, Jeffs K. Exercise for acutely hospitalised older medical patients. *Cochrane Database of Systematic Reviews* 2006, Issue 2. Art. No: CD005955. [DOI: 10.1002/14651858.CD005955]

de Morton 2007a

de Morton N, Keating JL, Jeffs K. Exercise for acutely hospitalised older medical patients. *Cochrane Database of Systematic Reviews* 2007, Issue 1. Art. No: CD005955. [DOI: 10.1002/14651858.CD005955.pub2] [PMID: 17253572]

* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Abizanda 2011

Study characteristics	
Methods	*Design:* RCT *Baseline time point (T1):* first 48 hours of admission *Outcome time point (T2):* day of discharge from hospital
Participants	*Inclusion criteria:* aged ≥ 65 years; admitted for an acute medical illness or exacerbation of a previous chronic condition; either participant or legal representative provided informed consent *Exclusion criteria:* none *Exercise arm* • *n at baseline:* 198 • *Age mean:* 83.3 (SD 6.5) years • *Women (n (%)):* 112 (56.6) • *Barthel Index (0–100) on admission:* 27.4 (23.4) • *Confusion on admission – CAM (n (%)):* 70 (35.3) *Control arm* • *n at baseline:* 202 • *Age mean:* 83.7 (SD 6.1) years • *Women (n (%)):* 115 (56.9) • *Barthel Index (0–100) on admission:* 31.8 (25.6) • *Confusion on admission – CAM (n (%)):* 48 (24)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* OT intervention + usual care. • *TIDieR item 2: (why: describe any rationale, theory, or goal of the elements essential to the intervention):* OT intervention could improve functional outcomes on an acute geriatric unit. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* see item 4.

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Abizanda 2011 *(Continued)*

- *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* day 1: OT assessment including instruction of the primary carer in patient mobilisation techniques. Day 2 until discharge: delivery of therapeutic plan (tailored to individual) may include: cognitive stimulation; instructions to family re. prevention of hospital-associated complications; retraining in ADLs (including mobility practice). Day of discharge: as day 2 to discharge with additional 30-minute session including: instructions to relatives/carers; assessment of technical aids; recommendations for patient maintenance/increased independence.
- *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* occupational therapist, trained by specialist geriatric therapist and by unit geriatricians.
- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* individually and face-to-face with participant and relative or carer.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* acute geriatric unit.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* approximately 1 hour to formulate therapeutic plan on day 1. From day 2 until discharge, 45 minutes sessions; day of discharge 30 minutes. Mean of 5 sessions per inpatient stay. Included 10 minutes of cognitive therapy; 30 minutes retraining of ADL and approximately 5 minutes family/carer education.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* personalised according to need based on assessment day 1.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* not specified.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* all participants received the treatment to which they were allocated. Mean number of OT sessions: 5.

Control arm

- *TIDieR item 1:* usual care.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* during hospitalisation, all participants received medical treatment, nursing care, PT, and social assistance in accordance with the usual practice of the unit. Participants were treated as per usual by a geriatrician who prescribed and adjusted the pharmacological and non-pharmacological treatment daily from admission to discharge. Physiotherapy was indicated as per usual, when the geriatrician considered appropriate, to participants in both trial arms. No other physical or cognitive therapy was administered to usual care participants.
- *TIDieR item 5:* geriatrician-led usual care; PT as appropriate.
- *TIDieR item 6:* not specified.
- *TIDieR item 7:* acute geriatric unit.
- *TIDieR item 8:* not specified.
- *TIDieR item 9:* as item 4.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* all participants received the treatment to which they were allocated.

Outcomes	Barthel Index (score of 0–100) at T2 Incidence of delirium during hospitalisation Falls during hospitalisation

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Abizanda 2011 *(Continued)*

	Mortality during hospitalisation Musculoskeletal injuries during hospitalisation Length of hospital stay
Notes	Participants randomised to intervention group were admitted for stroke more often than the control group (19.7% with intervention vs 7.9% with control; P < 0.01) and presented greater ambulation-dependence on admission (57.9% with intervention vs 41.8% with control; P < 0.01).

Asplund 2000

Study characteristics	
Methods	*Design:* RCT *Baseline time point (T1):* admission to hospital *Outcome time point (T2):* discharge from hospital *Follow-up time point (T3):* 3 months after discharge
Participants	*Inclusion criteria:* aged > 70 years; acutely admitted to University Hospital of Umeå for medical ailments *Exclusion criteria:* required treatment in specialised units, such as the intensive care unit, coronary care unit or acute stroke unit; or required treatment in 1 of the designated subspecialities such as in a renal care unit *Exercise arm* • *n at baseline:* 190 • *Age mean:* 80.9 (95% CI 80.1 to 81.9) years • *Women (n (%)):* 111 (58) • *Barthel Index (0–20) on admission:* 0–14 points: 16%; 15–19 points: 32%; 20 points: 52% • *Confusion on admission – CAM (n (%)):* 86 (47) *Control arm* • *n at baseline:* 223 • *Age mean:* 81.0 (95% CI 80.3 to 81.8) years • *Women (n (%)):* 140 (63) • *Barthel Index (0–20) on admission: 0–14 points:* 15%; 15–19 points: 41%; 20 points: 44% • *Confusion on admission – CAM (n (%)):* 113 (53)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* AGW. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* 1. When compared with participants admitted to general medical wards, global outcome at 3 months after admission is improved in participants acutely admitted to a dedicated geriatric medical unit. 2. Acute care in a dedicated geriatric unit reduces resource consumption without compromising participant outcome at 3 months. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* not specified. • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* the geriatric approach followed the principles outlined by the Nordic Working Group on geriatric assessment and rehabili-

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Asplund 2000 *(Continued)*

tation. Staffing of the ward was designed to optimise the conditions for treatment, nursing, early rehabilitation and planning of care for older, acutely ill patients. Care covered by both internists and geriatricians. MDT included nursing staff, physiotherapists, OTs and dietician (no social workers). Most participants assessed by physiotherapists and OTs. Early rehabilitation, interdisciplinary teamwork and 'intense' discharge planning.

- *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* the staff were recruited from geriatric, medical and surgical departments. There was a 1-week education period for the staff with emphasis on the principles of interdisciplinary and geriatric working forms and on ethical issues. This was followed by a 3-week run-in period of the AGW before the beginning of randomisation.
- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* face-to-face.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* AGW consisted of 11 beds and shared facilities with a surgical ward.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* not specified.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* not specified.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* not specified.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* fidelity to the intervention not described other than 4 participants refused to participate after first consenting.

Control arm

- *TIDieR item 1:* medical ward.
- *TIDieR item 2:* NA.
- *TIDieR item 3:* NA.
- *TIDieR item 4:* wards were covered by internists only (no geriatricians). Physiotherapists, OT and dietitian not routinely available. Only occasional assessment by physiotherapists or OT. Dedicated part-time social worker.
- *TIDieR item 5:* as item 4.
- *TIDieR item 6:* face-to-face.
- *TIDieR item 7:* 2 medical wards, 30 beds on each ward.
- *TIDieR item 8:* not specified.
- *TIDieR item 9:* not specified.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* not specified.

Outcomes	Barthel Index (categorised scores only) at T2 and T3 Mini-Mental State Examination at T3 Incidence of delirium during hospitalisation Length of hospital stay Adverse events (mortality during hospitalisation) New institutionalisation at discharge from hospital

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Asplund 2000 *(Continued)*

	Readmission to an acute hospital during first 3 months after discharge
Notes	

Blanc-Bisson 2008

Study characteristics	
Methods	*Design:* RCT *Baseline time point (T1):* within first 24 hours of admission *Outcome time point (T2):* when deemed clinically stable *Follow-up time point (T3):* 1 month after T2
Participants	*Inclusion criteria:* aged > 70 years; confined to bed or walking from bed to chair with human help, but independent for locomotion within 3 months; written consent from participants and surrogates *Exclusion criteria:* any neuromuscular diseases affecting lower limbs, chronic respiratory impairment, severe heart failure (New York Heart Association class IV), peripheral vascular disease, palliative care, use of drugs known to impair muscle function. Owing to PT availability, admitted patients in a period that was incompatible to PT intervention the following day after admission were excluded. Thus, no more than 5/20 patients admitted from Sunday to Thursday were included per week *Exercise arm* • *n at baseline:* 38 • *Age mean:* 85.5 (SD 6.0) years • *Women (n (%)):* 25 (65.8) *Control arm* • *n at baseline:* 38 • *Age mean:* 85.4 (SD 7.3) years • *Women (n (%)):* 30 (78.9)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* Acute Care for Elders programme (early and intense PT rehabilitation). • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* it was hypothesised the exercise programme may improve ADL performance. The intervention focused on leg extension exercises because knee and hip extensors are essential to perform independent activities, such as walking, stair climbing, and rising from a chair. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* not specified. • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* for crural triceps: 10 repetitions of dynamic work against the foot of the bed, extended legs to push the body to the top of the bed. If the participant was too weak, exercise was performed against the hand of the physiotherapist. When the participant was able to stand, exercises of plantar flexors and extensors were performed in the upright position. For all the leg: extended leg, hip flexion at 45° in alternate for each leg, each repetition is maintained 3–5 seconds, 10 repetitions with 10-second rest period between each. For the pelvis: knee flexed at 30°, moving pelvis to the left and to the right, 10 repetitions.

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Blanc-Bisson 2008 *(Continued)*

- *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* physiotherapists delivered the intervention, their experience/specific training was not specified.
- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* face-to-face.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* acute care geriatric medicine ward and in PT room.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* additional to usual care until participant deemed 'clinically stable'. Started on day 1 or 2 of hospitalisation. 30-minute sessions. Twice per day, five days per week.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* some modification for crural triceps exercises based on ability (see item 4).
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* exercise was supervised.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* fidelity not reported.

Control arm

- *TIDieR item 1:* acute care geriatric medicine unit.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* local policy indicated that participants should be transferred to armchair as soon as possible according to their general health status. From day 3 to 6, participants started to walk with human help with or without technical assistance in the PT room for 3 sessions per week until discharge. PT was continued at home for 1 month.
- *TIDieR item 5:* physiotherapists delivered the intervention, their experience/specific training was not specified.
- *TIDieR item 6:* face-to-face.
- *TIDieR item 7:* acute care geriatric medicine ward and in PT room.
- *TIDieR item 8:* from day 3 to 6, participants started to walk in the PT room for 3 sessions per week. After discharge PT was continued at home for 1 month.
- *TIDieR item 9:* as per item 4. Walking practice was with or without technical assistance.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* in-hospital walking practice supervised.
- *TIDieR item 12:* not specified.

Outcomes	Katz ADL score (0–12) at T2 and T3 Adverse events (mortality)
Notes	The intervention group had a higher mean BMI approaching significance ($P < 0.06$) and a higher mean weight approaching significance ($P < 0.07$).

Brown 2016

Study characteristics	
Methods	*Design:* RCT

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Brown 2016 *(Continued)*

	Baseline time point (T1): admission to hospital *Outcome time point (T2):* discharge from hospital *Follow-up time point (T3):* 4 weeks after discharge
Participants	*Inclusion criteria:* aged ≥ 65 years; with medical reason for admission; not being imminently terminal (death not expected in the next 30 days) *Exclusion criteria:* delirium (CAM score > 0); cognitive impairment (Mini-Cognitive Assessment score < 3); self-report of not being ambulatory with or without an assistive device in the 2 weeks before admission; significant language barrier that required a translator; being previously enrolled in the study *Exercise arm* • *n at baseline:* 50 • *Age mean:* 74.4 (SD 6.9) years • *Women (n (%)):* 2 (4) *Control arm* • *n at baseline:* 50 • *Age mean:* 73.4 (SD 7.0) years • *Women (n (%)):* 1 (2)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* mobility programme. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* mobility programme designed to address the evidence that older adults who experience low mobility during hospitalisation are at substantially increased risk of serious declines in strength and function, which may lead to long-term mobility disability. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* a rolling walker was provided if needed. Gait belts were used to ensure safe ambulation. A diary was provided to participants to record their physical activity, see item 9. • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* protocol for the mobility programme began with assisted sitting, then standing, progressing to weight shifting, stepping in place and ambulation as tolerated with the assistance of the research assistant. Additionally, a behavioural intervention was used to encourage additional physical activity outside supervised intervention. • *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* all members of the research team who transferred and walked with participants received in-depth training in safe patient handling techniques by physical therapists. Proficiency and competency were documented using objective standards. • *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* participants seen individually, face-to-face by the research assistant. • *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* medical ward. • *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* exercise was supervised up to twice per day for 15–20 minutes, 7 days per week. Although participants were encouraged to walk at each session, they could refuse any or all sessions. The research assistant attempted to make ≥ 3 visits for each scheduled walk. If a participant was away at a test or busy with another healthcare professional, the research assistant returned at a later time to walk with the participant. In addition to the mobility protocol, a behavioural intervention strategy was integrated to encourage participants to increase time spent out of bed.

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Brown 2016 *(Continued)*

- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* the level of out-of-bed activity was dependent on the individual participant and incorporated activities participants were deemed able to do independent of cueing or assistance during each walking session. The participant and research assistant set daily goals regarding the amount of time the participant would try to spend out of bed. The participants physical activity diary was used by the research assistants to reinforce positive behaviour and to set goals for the following day. In addition to goal setting, participants were encouraged to discuss any barriers to mobility they were experiencing. Using an interview guide, the research assistant asked about mobility challenges and prompted participants to develop potential solutions to these challenges.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* to assist in self-monitoring of out-of-bed mobility, the participants were provided with a diary that could be used to document each time they sat up or walked.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* the group completed 122 (51.3%) of the potential 238 walks. Reasons for lack of completion included participant refusal 18.9%, participant unavailable because of tests or procedures 16.4%, staff not available 11.3%, and other 2%. Although 45 walks were refused during the study, 28 refusals (62.2%) came from 4 participants. For the behavioural intervention component, which included goal setting and discussion of mobility barriers, the MP group completed 108 (80%) of the 135 visits.

Control arm

- *TIDieR item 1:* usual care.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* participants were provided with a diary that looked identical to those provided to the participants in the mobility programme group. The participants in the control arm were asked to document frequency of visitors, both family and healthcare professionals.
- *TIDieR item 4:* the participants received visits by the research assistant to control for the daily attention that intervention group received. Physicians were able to order PT services.
- *TIDieR item 5:* not specified.
- *TIDieR item 6:* participants seen individually, face-to-face by the research assistant.
- *TIDieR item 7:* medical ward.
- *TIDieR item 8:* the visits from the research assistant were approximately 15–20 minutes long and occurred up to twice per day 7 days per week.
- *TIDieR item 9:* not specified.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* the group completed 184/223 (82.5%) visits.

Outcomes	Katz ADL score (7–21) at T2 and T3 Incidence of delirium during hospitalisation Falls during hospitalisation Mortality during hospitalisation Medical deterioration during hospitalisation Length of hospital stay
Notes	

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Counsell 2000

Study characteristics	
Methods	*Design:* RCT *Baseline time point (T1):* admission to hospital *Outcome time point (T2):* discharge from hospital *Follow-up time point (T3):* 1, 3, 6 and 12 months after discharge
Participants	*Inclusion criteria:* ≥ aged 70 years, community-dwelling and admitted to a medicine or family practice service *Exclusion criteria:* transferred from a nursing facility or another hospital; required speciality unit admission (e.g. intensive care, coronary care, telemetry or oncology); admitted electively; had a length of stay < 2 days; had been previously enrolled in the study *Exercise arm* • *n at baseline:* 767 • *Age mean:* 80 (SD 7) years • *Women (n (%)):* 462 (60) • *Diagnosis of dementia (n (%)):* 120 (16) *Control arm* • *n at baseline:* 764 • *Age mean:* 79 (SD 7) years • *Women (n (%)):* 464 (61) • *Diagnosis of dementia (n (%)):* 137 (18)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* Acute Care for Elders unit. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* researchers hypothesised that Acute Care for Elders intervention will improve functional outcomes and the process of care in hospitalised older patients. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* full description of intervention provided in Landefeld and colleagues, 1995. The intervention included environmental changes with carpeting, handrails, large clocks and calendars, elevated toilet seats and door levers described. • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* physical and psychosocial function were assessed by the admitting nurse and daily interdisciplinary team rounds were conducted by the geriatrician medical director and geriatric clinical nurse specialist. Suggestions by the interdisciplinary team were recorded and communicated to the attending physician. Nursing care plans for fall risk assessment, mobility, self-care, skin integrity, nutrition, continence, confusion, depression and anxiety, which had been modified for the intervention from those used routinely on usual care units, were implemented when appropriate. Medications of potential risk to older patients were identified by the medical director, who recommended alternative treatments, including non-pharmacological interventions. • *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* nursing staff did not move between the intervention and usual care units, attending and resident physicians provided care to both groups. No other information regarding training/expertise provided. • *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* as item 4.

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Counsell 2000 *(Continued)*

- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* 34 bed Acute Care for Elders unit. Including a room for PT and a parlour for dining and visiting with family.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* not specified.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* as item 4.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* not specified.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* significant differences favouring Acute Care for Elders unit in: adherence to care plans promoting independent function; time to discharge planning first being mentioned; number of referrals to the social workers, and delay to referral; days of ordered bed rest; number of referrals to PT and delay to consult; number of participants with physical constraints and time the constraints were used for; number of participants with prescriptions of high-risk medication in first 24 hours. No differences in: number of participants who had an order of bed rest; number of participants with urinary catheters and time urinary catheters used for; number of participants with prescriptions of high-risk medications in day prior to discharge.

Control arm

- *TIDieR item 1:* usual care units.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* nursing staff-to-participant ratios were similar on the intervention and usual care units.
- *TIDieR item 5:* same nursing ratios.
- *TIDieR item 6:* not specified.
- *TIDieR item 7:* usual care units.
- *TIDieR item 8:* not specified.
- *TIDieR item 9:* not specified.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* not specified.

Outcomes	Katz ADL score (0–5) at T1 and T2 Physical Performance and Mobility Examination at T2 Mortality during hospitalisation Length of hospital stay Readmissions at 1 month after discharge from hospital New institutionalisation at discharge from hospital
Notes	

Courtney 2009

Study characteristics	
Methods	*Design:* RCT

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Courtney 2009 *(Continued)*

	Baseline time point (T1): within 72 hours of admission *Outcome time point (T2):* 4 weeks after discharge from hospital *Follow-up time point (T3):* 12 and 24 weeks after discharge
Participants	*Inclusion criteria:* aged ≥ 65 years, admitted with a medical diagnosis, with ≥ 1 risk factor for readmission (i.e. aged ≥ 75, multiple hospital admissions in previous 6 months, multiple comorbidities, living alone, lack of social support, poor self-rating of health, functional impairment, history of depression, or a combination of these) *Exclusion criteria:* requiring home oxygen; dependent on a wheelchair or unable to walk independently for 3 m, living in a nursing home; cognitive deficit; progressive neurological disease *Exercise arm* • *n at baseline:* 64 (58 reported in Courtney and colleagues *Journal of the American Geriatrics Society* 2009) • *Age mean:* 78.1 (SD 6.3) years • *Women (n (%)):* 36 (62.1) *Control arm* • *n at baseline:* 64 • *Age mean:* 79.4 (SD 7.3) years • *Women (n (%)):* 40 (62.5)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* older hospitalised patients' discharge planning and in-home follow-up. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* multifaceted transitional care intervention including hospital and home-based exercise strategies for at-risk older adults was hypothesised to reduce readmissions and improve functional outcomes of hospitalisation. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* care plan as described in item 4. Written guidelines were provided on postdischarge management, including diagrams and specific instructions for their exercise programme. • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* within 72 hours of admission, a nurse and physiotherapist undertook a comprehensive participant assessment and developed a goal-directed, individualised care plan in consultation with the participant, healthcare professionals, family and carers. The care plan included, an exercise intervention, a nursing intervention and an intervention after discharge. The exercise intervention included stretching, balance training, walking, strengthening (elbow flexors/extensors, hip flexors/extensors/abductors, knee extensors). The nursing intervention involved a nurse visiting the participant daily whilst in hospital to address concerns, facilitate the exercise programme and oversee discharge planning. While the participant remained in hospital, the nurse developed a transitional care plan covering the areas of functional ability and need for assistance with ADL, postdischarge treatments and follow-up care, social support, chronic disease management plans and information, medication information, community services, and assistance with the exercise programme. The intervention after discharge consisted of a home visit by the nurse within 48 hours of discharge, to assess availability of support, address transitional concerns, provide advice and support and ensure that the exercise programme could be safely undertaken at home. Extra home visits were provided if required. Weekly follow-up telephone calls were provided for 4 weeks, followed by monthly calls for a further 5 months. • *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* no specific training for the nurse specified, other than the nurse and physiotherapist combined their visits when planning, explaining and demonstrating the exercise programme to ensure continuity when the nurse continued to facilitate the exercise programme during extended hospital stays and at home.

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Courtney 2009 *(Continued)*

- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* the physiotherapist and nurse explained and demonstrated the exercise programme face-to-face. The daily visits whist in hospital by the nurse included 'facilitating the exercise programme'. Written guidance was provided for postdischarge management, and as described in item 4, postdischarge the participants received home visit(s) and regular telephone calls.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* in-hospital interventions were carried out on the medical wards. Postdischarge the intervention was carried out in the participants home.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* intervention commenced within the first 72 hours of admission, and continued daily during the participant's admission. Follow-up ended with a telephone call at 5 months postdischarge. The daily exercise programme included walking at a slow pace for 3–5 minutes, increasing to a moderate level for 5–10 minutes, followed by a slower pace, initially 2–3 times per week, increasing to 3–4 times per week. The strengthening component of the exercise programme was 2–3 times per week, increasing to 3–4 times per week, progressing from the lowest resistance to higher resistance depending on ability. Contractions were held for 3–5 seconds, repeated 5 times, and building to 2–3 sets of 10 repetitions.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* as in item 4 and 8. Care plan, exercise plan and postdischarge management tailored to individual.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* during the telephone follow-ups feedback was sought on the levels of adherence to the exercise programme and progress with the exercise plan and goals.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* 31 (53%) participants reported following their programme all the time or nearly every day, another 11 (19%) doing their exercises 3–4 days per week and 16 (28%) doing their exercises ≤ 2 days per week or none of the time.

Control arm

- *TIDieR item 1:* usual care.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* routine care as would normally be provided.
- *TIDieR item 5:* not specified.
- *TIDieR item 6:* face-to-face.
- *TIDieR item 7:* medical ward.
- *TIDieR item 8:* not specified.
- *TIDieR item 9:* not specified.
- *TIDieR item 10*: not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* not specified.

Outcomes	Katz ADL score (0–6) at T1 and T3 only Lawton Instrumental Activities of Daily Living Scale score (0–7) at T1 and T3 only Walking Impairment Scale at T1 and T3 only Quality of life at T1 and T3 only Mortality Adverse events (undefined composite score)

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Courtney 2009 *(Continued)*

	Length of hospital stay Readmissions at 6 months after discharge from hospital
Notes	Poor self-rating of health was higher in the intervention group compared to the control group (65% with intervention vs 47% with control; P = 0.038).

de Morton 2007

Study characteristics	
Methods	*Design:* RCT *Baseline time point (T1):* within 48 hours of admission *Outcome time point (T2):* within 48 hours of discharge from hospital *Follow-up time point (T3):* 1 month after discharge from hospital
Participants	*Inclusion criteria: aged* ≥ 65 years, diagnosed with a general medical condition, admitted to either of the 2 medical wards, and assessed within 48 hours of admission *Exclusion criteria:* admitted to hospital from a nursing home, assessed to need nursing home level of care or palliative care; had a stroke or a condition for which mobilisation was contraindicated (e.g. deep vein thrombosis or fracture); too medically unwell to ambulate or exercise; readmitted having previously participated in the study *Exercise arm* • *n at baseline:* 110 • *Age mean:* 80 (SD 8) years • *Women (n (%)):* 61 (55.5) • *Barthel Index (0–100) on admission (mean):* 66 (SD 26) *Control arm* • *n at baseline:* 126 • *Age mean:* 78 (SD 7) years • *Women (n (%)):* 68 (54) • *Barthel Index (0–100) on admission (mean):* 68 (SD 26)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* usual care + additional exercise programme. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* the primary hypothesis was that exercise intervention for hospitalised acute general medical patients would reduce the requirements for inpatient rehabilitation. The secondary hypothesis was that the intervention would improve hospital outcomes and measures of participant activity limitation at hospital discharge. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* not specified. • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* the additional exercise programme was designed by a physiotherapist and consisted of exercises for the upper limb, lower limb and trunk. It included 4 exercise levels (level 1: bed exercise programme, level 2: sitting exercise programme, level 3: standing exercise programme and level 4: stairs exercise programme). Gravity,

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de Morton 2007 *(Continued)*

bodyweight and light weights were used for resistance whenever possible. A certified allied health assistant supervised each session.

- *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* the project physiotherapist had 4 years of clinical experience.
- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* individual face-to-face sessions supervised by an allied health assistant.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* medical ward.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* starting the day of recruitment, the additional exercise was twice daily, 5 days per week. Session duration 20–30 minutes.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* the project physiotherapist prescribed the programme level and individually tailored the exercises to safely challenge each participant in the experimental group. Participants with reduced exercise tolerance exercised more frequently for shorter periods. Exercise resistance was increased when participants could perform 10 repetitions. Participants were also encouraged to increase exercise repetitions and their walking distances as tolerated.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* not specified.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* referrals for usual PT care were received for 94% of the intervention group. Both groups received a median of 3 sessions (IQR 2–5) of usual PT care (P = 0.50). Participants in the intervention group received a median of 90 minutes (IQR 40 to 131) of usual PT care.

Control arm

- *TIDieR item 1:* usual care.
- *TIDieR item 2:* comparison with usual care.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* usual care included daily medical assessment, 24-hour nursing assistance and allied health service on referral from medical, nursing or other allied health staff.
- *TIDieR item 5:* 4 teams delivered general medical care and were not ward specific whereas nursing staff were ward specific.
- *TIDieR item 6:* face-to-face provided to individual participants.
- *TIDieR item 7:* medical ward.
- *TIDieR item 8:* daily with 24-hour nursing assistance.
- *TIDieR item 9:* not specified.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* referrals for usual PT care were received for 96% of the control group. Participants received a median of 80 minutes (IQR 40–145) of usual PT care.

Outcomes	Barthel Index (score of 0–100) at T2
	Functional Ambulatory Category at T2
	Falls during hospitalisation
	Mortality during hospitalisation
	Medical deterioration during hospitalisation
	Length of hospital stay

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de Morton 2007 *(Continued)*

	Readmissions within the first 28 days after discharge New institutionalisation at discharge from hospital Timed Up and Go at T2
Notes	Participants in intervention group were a mean 2 years older.

Ekerstad 2017

Study characteristics	
Methods	*Design:* quasi-RCT *Baseline time point (T1):* admission to hospital *Outcome time point (T2):* (quote) "intention was to perform the initial physical tests during the latter part of the hospital stay, before discharge." *Follow-up time point (T3):* 3 months after discharge
Participants	*Inclusion criteria:* aged ≥ 75 years, in need of in-hospital treatment, and with ≥ 2 of the following FRail Elderly Support researcH group (FRESH) criteria: general fatigue, tiredness from a short walk, dependence in shopping, frequent falls/anticipation of falls, or ≥ 3 more visits to the emergency ward during the last 12 months *Exclusion criteria:* person clearly suited for care in a conventional acute medical care unit due to the severity and type of condition: acute stroke, acute myocardial infarction, sepsis, or other acute life-threatening conditions; patient declined participation in study; informed consent could not be obtained from the patient (and it was not possible to obtain informed consent from a relative); or the patient was a previously defined MÄVA (acute elderly care CGA units) patient *Exercise arm* • *n at baseline:* 206 • *Age mean:* 85.7 (SD 5.3) years • *Women (n (%)):* 122 (59) • *Diagnosis of dementia (n (%)):* 20 (10) *Control arm* • *n at baseline:* 202 • *Age mean:* 85.6 (SD 5.4) years • *Women (n (%)):* 108 (53%) • *Diagnosis of dementia (n (%)):* 27 (13)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* CGA and care units. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* CGA units are believed to be associated with less functional decline at discharge, lower mortality and higher probability of living at home. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* not specified. • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* participants were admit-

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Ekerstad 2017 *(Continued)*

ted directly to the CGA ward from the ambulance. Participants received interdisciplinary assessment (CGA), early discharge planning, mobility and ADL assessment early in their admission. Participants were provided with appropriate assistive devices, and had ad hoc counselling regarding exercise post-discharge. Daily team conferences to discuss progress occurred.

- *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* the CGA unit was staffed by physicians specialising in internal medicine, family medicine or geriatrics (or a combination of these), licenced practising nurses, including specialised admission and discharge nurses, OTs and PTs. Nutritionists available for "counselling only".
- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* face-to-face.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* 2 MÄVA (acute elderly care CGA units) wards with total of 48 beds; 1, 2, or 4-bedded rooms. Wards already in existence for 4 years prior to study.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* not specified.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* care adjusted to needs of individuals as per CGA and multidisciplinary working.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* not specified.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* not specified.

Control arm

- *TIDieR item 1:* acute medical care unit.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* participants were admitted via the emergency department and received routine care as per clinical guidelines.
- *TIDieR item 5:* acute medicinal care units staffed by physicians specialising in internal medicine, and licenced practising nurses. Physiotherapists, OTs and nutritionists available for counselling only.
- *TIDieR item 6:* face-to-face.
- *TIDieR item 7:* wards of internal and emergency medicine; 1, 2, or 4-bedded rooms.
- *TIDieR item 8:* not specified.
- *TIDieR item 9:* not specified.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* not specified.

Outcomes	ADL staircase (0–9) assessed at T2 and T3 6-minute walk test assessed at T2 and T3 Timed Up and Go assessed at T2 and T3 Quality of life (EQ-5D VAS) assessed at T2 and T3 Mortality during hospitalisation Length of hospital stay Readmissions in first 3 months following discharge

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Ekerstad 2017 *(Continued)*

Notes	Higher proportion of control group (38%) compared to the intervention group (29%) were from home living without help. Intervention group had a higher mean Charlson Co-morbidity Index score than the control group (7.4 with intervention vs 6.2 with control).

Fretwell 1990

Study characteristics	
Methods	*Design:* RCT *Baseline time point (T1):* first 24 hours of admission to hospital *Outcome time point (T2):* discharge from hospital *Follow-up time point (T3):* 6 weeks, 3 and 6 months after randomisation
Participants	*Inclusion criteria:* aged ≥ 75 years, not on protocol treatment or require admission to coronary or intensive care; if their physician provided consent *Exclusion criteria:* none *Exercise arm* • *n at baseline:* 221 • *Age mean:* 83.5 (SD 5.3) years • *Women (n (%)):* 158 (71.5) *Control arm* • *n at baseline:* 215 • *Age mean:* 83.0 (SD 5.7) years • *Women (n (%)):* 154 (71.6)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* senior care unit. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* it was hypothesised that if assessment was initiated early in a participant's stay, utilised existing personnel and was integrated into everyday practice of hospital staff, an interdisciplinary geriatric assessment process could prevent the decline of the older participants' physical, mental and emotional functions without increasing length of stay or hospital charges. Mortality expected to be similar for the 2 groups. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* not specified. • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* a functional assessment was performed by nurses within their routine admission evaluations of older patients. A geriatric assessment team evaluated the participants. 3 clinic-team meetings and 1 administrative team meeting per week occurred. Individualised care plans were developed, consultation care plans were placed in each participant's chart. Before participant discharge, an updated care plan documenting the problems that remained unresolved at discharge was prepared. The nurse co-ordinator provided telephone follow-up weekly for 1 month, and once at 2 months postdischarge. Participants who remained unstable at 1 month received weekly calls for up to 1 more month. • *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* the geriatric assessment team included a physician specialising in geriatric medicine, the nurse co-ordinator, a physiothera-

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Fretwell 1990 *(Continued)*

pist, a clinical pharmacist, a dietitian and a social worker. Experienced nurses undertook 4-month rotations as co-ordinators of the geriatric assessment team.

- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* participants were treated face-to-face by all members of the team except the geriatrician. See item 4 for description of telephone follow-up reviews.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* 18-bed medical ward.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* not specified.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* individual care plans created.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* not specified.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* house staff present 20% of the time. 84% of participants discussed at initial meeting and 91% at discharge meeting. Compliance for implementing recommendations from MDT meetings 0.65 (mean number generated per participant: 9.53 (SD 5.3), number implemented: 6.1 (SD 4.7)).

Control arm

- *TIDieR item 1:* usual care.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* not specified.
- *TIDieR item 5:* not specified.
- *TIDieR item 6:* not specified.
- *TIDieR item 7:* traditional medical or surgical wards of the hospital.
- *TIDieR item 8:* not specified.
- *TIDieR item 9:* not specified.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* not specified.

Outcomes	Katz ADL (score of 0–5) at T3 only Modified Mini-Mental State Examination at T3 only Mortality during hospitalisation Length of hospital stay New institutionalisation at discharge from hospital
Notes	

Gazineo 2021

Study characteristics	
Methods	*Design:* RCT

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Gazineo 2021 *(Continued)*

	Baseline time point (T1): within 24 hours of hospital admission *Outcome time point (T2):* hospital discharge *Follow-up time point (T3):* 1 and 3 months posthospital discharge
Participants	*Inclusion criteria:* all participants consecutively admitted to the geriatric unit between October 2018 and January 2020, if they were aged ≥ 65 years and if they were potentially able to walk, as assessed through geriatrician's clinical judgement based on participant's current and preadmission status *Exclusion criteria:* independent walking ability at admission; diagnosis of femoral fractures or stroke (due to the presence of specific rehabilitation pathways for these patients), coma and severe dementia; unable to provide informed consent or refused to participate in the study *Exercise arm* • *n at baseline:* 193 • *Age mean:* 86.39 (SD 7.11) years • *Barthel Index (0–100) on admission:* 64.92 (SD 16.62) *Control arm* • *n at baseline:* 194 • *Age mean:* 86.19 (SD 9.15) years • *Barthel Index (0–100) on admission:* 61.84 (SD 16.06)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* individualised assisted walking programme. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* a number of cohort and randomised clinical trials have found the potential beneficial effects of hospital mobility in preventing loss of mobility associated with hospitalisation. The study aimed to see if a nurse-led mobility programme is also beneficial. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* walking aids were provided if appropriate. • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* the intervention was described including: moving from the supine to sitting position with their legs hanging over the side of the bed, from sitting to standing and an active phase of walking with assistance. The nurse delivering the intervention also provided education to participants and carers to consider walking as a normal activity, and provided motivation and encouragement. • *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* the intervention was delivered by an ad hoc registered nurse with specific training on assisted walking and experience in clinical research conducted each participant's session. Each day they met with the geriatrician in charge to discuss the suitability of each participant. • *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* individual and conducted face-to-face. • *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* 32-bed geriatric unit of the University Hospital of Bologna. • *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* intervention was offered from the first day after admission and continued until the day before discharge. Intervention consisted of daily sessions of 20–30 minutes' duration, for 5 consecutive days (excluding weekends).

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Gazineo 2021 *(Continued)*

- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* a daily briefing session was held between the trained nurse and the geriatrician in charge before starting the intervention to assess the feasibility for each participant. Another important role of the trained nurse was to educate participants and reference carers to consider walking as a normal activity, and to provide motivation and encouragement.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* adherence to the intervention was defined as execution of postural changes and assisted walking for at least half of the inpatient days, except for weekend and days of admission and of discharge. This was assessed and recorded on a daily basis. The treatment was considered complete if a minimum of 2 days of individualised assisted walking programme was conducted.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* the mean number of intervention days for each participant was 5.84 (SD 4.17) days. Mobilisation or walking sessions occurred on the geriatric ward for a mean time of 32.10 (SD 10.25) minutes (range 10–67 minutes) with a mean distance of 89.19 (SD 70.26) m (range 0–260 m).

Control arm

- *TIDieR item 1:* usual care.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* during the mornings of weekdays, participants were encouraged and helped by nursing staff to get out of bed as early as possible and to sit on wheelchair or at a table. Participants were also accompanied to the bathroom for hygienic care, based on their functional capacity.
- *TIDieR item 5:* nursing staff delivered mobility and rehabilitation interventions. No PT or OT were provided for either the intervention or control group participants.
- *TIDieR item 6:* not specified.
- *TIDieR item 7:* 32-bed geriatric unit of the University Hospital of Bologna.
- *TIDieR item 8:* not specified.
- *TIDieR item 9:* not specified.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* not specified.

Outcomes	Barthel Index at T2 Mobility Barden Activity Subscale at T2 Falls during hospitalisation Mortality during hospitalisation Length of hospital stay Hospital readmissions at T3
Notes	*Unpublished data from email correspondence* Barthel Index: the mean scores at discharge (T2) were: 65.20 (SD 24.18) for the intervention group and 56.07 (SD 23.74) for the control group. Mobility Barden Activity Subscale: the mean scores at discharge (T2) were: 3.43 (SD 0.64) for the intervention group and 2.80 (SD 0.69) for the control group. Hospital readmissions: at 30-day follow-up (T3) 33/174 of intervention group vs 40/165 of control group had been readmitted.

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Hu 2020

Study characteristics	
Methods	*Design:* RCT (3 arms) *Baseline time point (T1):* within 48 hours of hospital admission *Outcome time point (T2):* at hospital discharge *Follow-up time point (T3):* 1 and 3 months after hospital discharge
Participants	*Inclusion criteria:* aged ≥ 65 years, if their hospital admission with a medical diagnosis had been unplanned, and if they had been able to walk independently 2 weeks before admission (participants independently using walking aids were included) *Exclusion criteria:* admission due to severe acute illness (immediately requiring intensive care); needing hospice care or surgery; having severe cognitive impairment; admitted for < 72 hours; or being diagnosed with an illness requiring activity restraint *Exercise arm* • *n at baseline:* 50 • *Age mean:* 76.00 (SD 7.06) years • *Women (n (%)):* 27 (35.1) *'Reminder' arm (not included in meta-analysis)* • *n at baseline:* 50 • *Age mean:* 77.08 (SD 6.57) years • *Women (n (%)):* 25 (32.5) *Control arm* • *n at baseline:* 50 • *Age mean:* 77.26 (SD 7.20) years • *Women (n (%)):* 25 (32.5)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* reablement (exercise programme with supervision or assistance, or both) and usual care. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* the intervention was designed to improve functional outcomes and quality of life. The simplified reablement programme in this study was based on a literature review and the developed programme was validated through expert consensus. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* mini-pedal bike able to be used in supine and seated position. • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* the programme was tailored to the participant's ability and consisted predominantly of mobility activities designed to be carried out in a hospital setting. A researcher undertook the supervision and assistance each morning for the participant's assigned reablement intervention. The intervention activities included, sitting and standing balance training, use of a mini-pedal bike in supine or seated position, ambulation training with or without assistance (assistance from family or walking aids). • *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* not specified other than 'the researcher'.

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Hu 2020 *(Continued)*

- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* individually face-to-face.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* the medical wards of a 1135-bed tertiary-care medical centre in southern Taiwan.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* the programme commenced within 48 hours of admission and continued throughout hospitalisation. Intervention duration for a maximum of 30 minutes per day (e.g. if a participant was able to walk independently and be assigned to level 4 (ambulation training), then that participant could choose to walk for 10 minutes 3 times per day or to walk for 30 minutes once per day if he/she could tolerate it).
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* the intervention consisted of 4 levels. Exercises progressed based on the participants functional ability, which was assessed daily.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* not specified.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* not specified.

'Reminder' arm (not included in meta-analysis)

- *TIDieR item 1:* reminder group (reminding to complete exercise programme, no supervision or assistance).
- *TIDieR item 2:* the intervention was designed to minimise functional decline in older people and promote and optimise functional independence.
- *TIDieR item 3:* mini-pedal bike able to be used in supine and seated position.
- *TIDieR item 4:* participants' functional level was assessed daily, and they received verbal encouragement from the researcher to continue their reablement assignments for 30 minutes each day.
- *TIDieR item 5:* not specified other than 'the researcher'.
- *TIDieR item 6:* individual, face-to-face reminders.
- *TIDieR item 7:* the medical wards of a 1135-bed tertiary-care medical centre in southern Taiwan.
- *TIDieR item 8:* the programme commenced within 48 hours of admission and continued throughout hospitalisation.
- *TIDieR item 9:* the intervention consisted of 4 levels. Exercises progressed based on the participants functional ability, which was assessed daily.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* not specified.

Control arm

- *TIDieR item 1:* usual care.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* usual care included medical intervention consistent with the participant's diagnosis and resources available on the acute medical wards.
- *TIDieR item 5:* not specified.
- *TIDieR item 6:* not specified.
- *TIDieR item 7:* the medical wards of a 1135-bed tertiary-care medical centre in southern Taiwan.
- *TIDieR item 8:* not specified.
- *TIDieR item 9:* not specified.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.

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Hu 2020 *(Continued)*

	• *TIDieR item 12:* not specified.
Outcomes	Katz ADL score (7–21) EQ-5D VAS at T2 Medical deterioration during hospitalisation Mortality during hospitalisation Length of hospital stay Timed Up and Go at T2
Notes	

Jeffs 2013

Study characteristics	
Methods	*Design:* RCT *Baseline time point (T1)*: within 48 hours of admission *Outcome time point (T2):* within 24 hours of discharge from hospital
Participants	*Inclusion criteria:* aged ≥ 65 years, admitted to a medical unit in the study area and in hospital for < 48 hours at the point of recruitment *Exclusion criteria:* severe dysphasia rendering communication impossible; death expected within 24 hours; isolation for infection control; documented contraindication to mobilisation; admission to the stroke unit or to critical care (intensive or coronary care); planned admission of < 48 hours; major psychiatric diagnosis (e.g. schizophrenia); previous inclusion in the study; delirium documented in the admission notes; transfer from another hospital *Exercise arm* • *n at baseline:* 305 • *Age mean:* 79.6 (SD 7.5) years • *Women (n (%)):* 168 (55) • *Barthel Index (0–100) on admission (mean):* 91 (IQR 71–100) • *Confusion on admission – CAM (n (%)):* 0 (0) • *Diagnosis of dementia (n (%)):* 38 (13) *Control arm* • *n at baseline:* 343 • *Age mean:* 79.1 (SD 7.9) years • *Women (n (%)):* 172 (50) • *Barthel Index (0–100) on admission (mean):* 90 (IQR 71–100) • *Confusion on admission – CAM (n (%)):* 0 (0–0) • *Diagnosis of dementia (n (%)):* 50 (15)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* graded physical activity, orientation programme and usual care.

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Jeffs 2013 *(Continued)*

- *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* physical activity and orientation intervention was designed to target 2 power risk factors of delirium, immobilisation and cognitive impairment.
- *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* light weights used for some resistance exercises.
- *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* commensurate with ability, participants were prescribed 1 of 4 exercise programmes: bed, seated, standing or rails. Gravity, body or light weights were used as resistance as appropriate. Resistance was increased whenever a participant could perform 10 repetitions at the previous level. The orientation programme comprised formal and informal elements. The formal element of the programme comprised 7 questions aimed at assessing and improving orientation (day, month, year, date, ward, bed number and name of primary nurse). The participant was asked the questions in sequence and prompted with the correct answer if they were unable to give a correct response. The informal element of the programme related to engaging in the exercise programme and in the social interaction with the allied health assistant or physiotherapist (or both).
- *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* a certified allied health assistant, trained in administering exercise programme, delivered the intervention after initial assessment of the participant by a physiotherapist.
- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* face-to-face, hospital ward based.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* medical unit.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* twice per day until discharge, beginning the same day the participant was randomised. Participants received approximately 20–30 minutes of additional therapy per session during weekdays. Suitable participants were encouraged to continue the exercise programme over weekends.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* all programmes were customised to the participant's ability and were reviewed daily in order to ascertain if: the programme could be completed safely; the level of difficulty was appropriate to the participant's ability; there had been improvement or deterioration in the participant's condition necessitating a programme change; and if the allied health assistant was having any problems in delivering the programme. Exercise programmes were modified to ensure suitable progression for those participants who made significant gains.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* the allied health assistant or physiotherapist (or both) recorded adherence. All therapy encounters were recorded and reasons for non-attendance were detailed. Exercise sheets were reviewed daily to monitor adherence to the programme. The amount (in minutes) of therapy received by participants was recorded. All routine PT and allied health assistant encounters were recorded on a hospital database.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* participants received a median of 1.4 (IQR 0.9–1.8) therapeutic encounters per day. Intervention participants received a median of 38 (IQR 25–52) minutes of therapy daily.

Control arm

- *TIDieR item 1:* usual care.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* usual care included 24 hours nursing care, daily medical assessment and allied health referral by medical, nursing or other staff. Allied health input was provided on referral only, but daily ward meetings were held to review participant progress and facilitate referrals. Participants with sig-

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Jeffs 2013 *(Continued)*

	nificant functional, cognitive or social issues could be referred to the Aged Care medical consultation service that performed a daily round and could offer advice regarding the recognition, investigation and management of geriatric syndromes including delirium. • *TIDieR item 5:* usual ward-based health professionals. Referral to allied health input provided but not routine provision. • *TIDieR item 6:* face-to-face, hospital ward based. • *TIDieR item 7:* medical unit. • *TIDieR item 8:* as item 4. • *TIDieR item 9:* as item 4. • *TIDieR item 10:* not specified. • *TIDieR item 11:* not specified. • *TIDieR item 12:* participants received 0.3 (IQR 0–0.6) therapeutic encounters per day and 8 (IQR 0–17) minutes of therapy per day.
Outcomes	Barthel Index at hospital discharge Mini-Mental State Examination at hospital discharge Incidence of delirium during hospitalisation Mortality during hospitalisation Adverse events (composite score only) during hospitalisation Length of hospital stay New institutionalisation at hospital discharge
Notes	*Unpublished data from email correspondence and author's PhD thesis:* Barthel Index: the median and IQR of scores at discharge (T2) were: 95 (IQR 78 to 100; 305 participants) in the intervention group, and 96 (IQR 77 to 100; 343 participants) in the control group.

Jones 2006

Study characteristics	
Methods	*Design:* RCT *Baseline time point (T1):* within 48 hours of admission *Outcome time point (T2):* within 24 hours of discharge from hospital
Participants	*Inclusion criteria:* aged ≥ 65 years, general medical admission to the general medical wards; provided informed consent *Exclusion criteria:* admitted from a nursing home or who were receiving nursing home level of care at home; medically unstable or where mobilisation was contraindicated by the treating medical team; admitted to the delirium management unit; non-weight-bearing; not assessed within 48 hours of admission; assessed as requiring palliative care; admitted to hospital with a diagnosis known to cause functional impairment; or who had an expected length of stay < 24 hours *Exercise arm* • *n at baseline:* 80 • *Age mean:* 81.9 (SD 8.0) years • *Women (n (%)):* 43 (53.8) • *Barthel Index (0–100) on admission (median):* 71 (IQR 51.5–83.0)

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Jones 2006 *(Continued)*

- *Confusion on admission – CAM (n (%)): 30 (37.5)*

Control arm

- *n at baseline:* 80
- *Age mean:* 82.9 (SD 7.6) years
- *Women (n (%)):* 49 (61.3)
- *Barthel Index (0–100) on admission (median):* 61 (IQR 40.5–82.5)
- *Confusion on admission – CAM (n (%)):* 37.5 (46)

Interventions

Exercise arm

- *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* exercise intervention + usual care.
- *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* hypothesised that an exercise programme + usual care in the acute setting may improve functional outcomes and reduce health service utilisation.
- *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* not specified other than not requiring expensive or specialist equipment.
- *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* participants randomised to the intervention group were assigned to 1 of 4 levels of an exercise programme depending on their functional status as assessed at baseline. The exercise intervention focused on targeted strength, balance and functional exercises. Level 1: bed exercises including targeted lower, upper limb and abdominal strengthening exercises in supine position and sitting balance exercises. Level 2: sitting exercise programme includes targeted lower limb, upper limb and abdominal strengthening exercises in sitting position, sit to stand exercises, marching on the spot and standing balance exercises. Level 3: standing exercise programme including targeted lower limb, upper limb and abdominal strengthening exercises in standing position, sit to stand exercises, step up exercises, standing balance exercises and ambulation. Level 4: stairs exercise programme includes targeted lower limb, upper limb and abdominal strengthening exercises in standing position, step up exercises and walking up flights of stairs, standing balance exercises and ambulation.
- *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* an allied health assistant supervised/assisted with the exercise programme.
- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* face-to-face.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* general medical wards.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* the exercise programme was carried out for approximately 30 minutes, twice daily.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* the exercise programmes were tailored to the individual's ability, consisted predominantly of strengthening and mobility exercises. Assigned to 1 of 4 levels of an exercise programme depending on their functional status as assessed at baseline.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* the amount of time (in minutes) spent by the person participating in the programme was recorded.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* the intervention group received a median of 100 minutes (IQR 37.5–225). In addition, the intervention group spent a median of 160 minutes (IQR 120–360) participating in the exercise intervention.

Control arm

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Jones 2006 *(Continued)*

- *TIDieR item 1:* usual care.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* medical, nursing and allied health intervention and discharge planning were consistent with the participant's diagnosis and resources available on the acute general medical wards. Usual care PT in an acute medical ward was focused on assessment and planning for discharge.
- *TIDieR item 5:* not specified.
- *TIDieR item 6:* face-to-face.
- *TIDieR item 7:* general medical wards.
- *TIDieR item 8:* not specified.
- *TIDieR item 9:* not specified.
- *TIDieR item 10:* not specified.
- *TIDieR item 11*: not specified.
- *TIDieR item 12:* the control group received a median of 90 minutes (IQR 42.5–232.5) of 'usual care' PT intervention during their acute hospitalisation.

Outcomes	Barthel Index (score 0–100) at T2 Falls during hospitalisation Medical deterioration during hospitalisation Mortality during hospitalisation Length of hospital stay Timed Up and Go at T2
Notes	The control group had lower proportion of people from their own home compared to the intervention group (88.8% with intervention vs 76.3% with control). Mean modified Barthel Index was higher in the intervention group compared to the control (71 with intervention vs 61 with control).

Killey 2006

Study characteristics	
Methods	*Design:* RCT *Baseline time point (T1):* hospital admission *Outcome time point (T2):* 7 days after T1
Participants	*Inclusion criteria:* aged ≥ 70 years; admitted to the medical wards; unable to walk by themselves, or displayed inhibition going for a walk by themselves; a provisional diagnoses including heart-, lung- and diabetes-related morbidities *Exclusion criteria:* unable to understand plain English statement and consent form; people with a stroke and undergoing rehabilitation with the physiotherapist; significant dementia precluding the possibility of gathering reliable exercise self-efficacy data *Exercise arm* • *n at baseline:* 27 • *Age mean:* 84.00 (SD 6.19) years • *Barthel Index (0–100) on admission:* 59.15 *Control arm*

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Killey 2006 *(Continued)*

- *n at baseline:* 28
- *Age mean:* 82.54 (SD 7.45) years
- *Barthel Index (0–100) on admission:* 58.07

Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* supervised or assisted walking. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* due to benefits observed in walking programmes in other settings the authors aimed to test whether similar benefits are observed in functional independence and exercise self-efficacy in older hospitalised people. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* walking aids as required. • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* participants were supervised or assisted by nursing staff to go for a walk twice per day. Participants were provided with a chair to rest midway through their walk. • *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* the nursing staff in the units were encouraged to attend a short education session that covered the intent of the research and the way in which the walking programme was to be implemented. They were instructed that the general intent was to encourage and enable a longer walk on each occasion. • *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* face-to-face, individually. • *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* 3 medical units. • *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* twice per day, 7 days per week. The distance walked twice per day was the maximum distance able to be comfortably walked as decided by that individual at that time. • *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* the distance walked twice per day was the maximum distance able to be comfortably walked as decided by that individual at that time. Jirovec's (1991) technique was followed in determining their comfortable limit. • *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified. • *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* the supervising staff member was asked to document the walk and the approximate distance. • *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* not specified other than 2 participants were excluded from analyses as they completed < 70% of their walks. *Control arm* • *TIDieR item 1:* usual care. • *TIDieR item 2:* not specified. • *TIDieR item 3:* not specified. • *TIDieR item 4:* the participants received normal levels of nursing care and assistance during their hospitalisation. They were encouraged to be 'normally ambulant'. Many, if not most of the sample had 1 or 2 visits from a physiotherapist. • *TIDieR item 5:* not specified. • *TIDieR item 6:* not specified. • *TIDieR item 7:* 3 medical units. • *TIDieR item 8:* not specified.

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Killey 2006 *(Continued)*

- *TIDieR item 9:* not specified.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* not specified.

Outcomes	Barthel Index at T2 Falls during hospitalisation Mortality during hospitalisation Maximum distance able to walk at T2
Notes	Excluded participants discharged before day 7 of hospitalisation (9 participants in intervention group vs 7 participants in control group), and those who completed < 70% of the intervention (2 participants).

Landefeld 1995

Study characteristics	
Methods	*Design:* RCT *Baseline time point (T1):* admission *Outcome time point (T2):* discharge *Follow-up time point (T3):* 3 month after discharge from hospital
Participants	*Inclusion criteria:* aged ≥ 70 years, admitted for general medical care *Exclusion criteria:* people who were admitted to a speciality unit (e.g. intensive care, cardiology–telemetry, or oncology). At the time of admission beds were not available in both the intervention and usual care units *Exercise arm* • *n at baseline:* 327 • *Age mean:* 80.2 (SD 6.9) years • *Women (n (%)):* 223 (68%) • *Diagnosis of dementia (n (%)):* 31 (10) *Control arm* • *n at baseline:* 324 • *Age mean:* 80.1 (SD 6.6) years • *Women (n (%)):* 212 (65%) • *Diagnosis of dementia (n (%)):* 41 (13)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* Acute Care for Elders programme. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* the Acute Care for Elders programme was designed to help people maintain or achieve independence in basic ADL through the combined effects of 4 key elements: a specially designed environment, participant-centred care, planning for discharge and review of medical care. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of interven-*

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Landefeld 1995 *(Continued)*

tion providers): environmental changes with carpeting, handrails, large clocks and calendars, elevated toilet seats and door levers described.

- *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* the Acute Care for Elders programme consisted of 4 key elements: a prepared environment (see item 3), participant-centred care, planning for discharge and medical care review. The participant-centred care included: daily assessment by nurses of physical, cognitive and psychosocial function; protocols to improve self-care, continence, nutrition, mobility, sleep, skin care, mood, cognition (implemented by the primary nurse and based on their daily assessment); daily rounds by the MDT led by the medical and nursing directors with the primary nurse, social worker, nutritionist, physiotherapist and visiting-nurse liaison. Planning for discharge included: early, ongoing emphasis on the goal of returning home; assessment of plans and needs for discharge by a nurse at the time of admission; early involvement of a social worker and home healthcare nurse, if needed. Medical care review included: daily review by the medical director of medicines and planned procedures; protocols to minimise the adverse effects of selected procedures and medications. Extramural grant support provided funds for increases in hours worked in the intervention unit by the medical and nursing directors, social worker, physiotherapist, OT and dietitian (equated to < 1 additional full-time person per year).
- *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* as per item 4. Staff who provided services were the same in both groups.
- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* face-to-face.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* Acute Care for Elders unit with environment as per item 3.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* as described in item 4. Daily MDT rounds and assessment by nurses of physical cognitive and psychosocial function.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* as described in item 4, participant-centred care based on the daily assessment by the primary nurse. Daily MDT rounds.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* not specified.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* not specified.

Control arm

- *TIDieR item 1:* usual care.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* usual care unit, had same hospital-supported staff-to-participant ratios and used the same hospital-wide support services, including social work, PT and nutritionists.
- *TIDieR item 5:* staff who provided services were the same in both groups.
- *TIDieR item 6:* face-to-face.
- *TIDieR item 7:* general medical unit.
- *TIDieR item 8:* not specified.
- *TIDieR item 9:* not specified.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* not specified.

Outcomes	ADL (score of 0–5) at T2 and T3

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Landefeld 1995 *(Continued)*

	IADL (score of 0–7) at T3 Mini-Mental State Examination at T2 Mortality during hospitalisation Length of hospital stay Readmissions in the first 3 months after discharge
Notes	Participants assigned to the intervention group reported better overall health status at admission (P = 0.04) and were less likely to have a clinical diagnosis of cerebrovascular disease (P = 0.05).

Martinez-Velilla 2019

Study characteristics	
Methods	*Design:* RCT *Baseline time point (T1):* within 48 hours of admission *Outcome time point (T2):* discharge from hospital *Follow-up time point (T3):* 3 months after discharge
Participants	*Inclusion criteria:* aged ≥ 75 years; Barthel Index ≥ 60; able to ambulate with/without assistance; able to communicate and collaborate with the research team *Exclusion criteria:* expected length of stay < 6 days; very severe cognitive decline (i.e. Global Deterioration Scale score 7); terminal illness; uncontrolled arrhythmias; acute pulmonary embolism; recent myocardial infarction; recent major surgery; extremity bone fracture in past 3 months *Exercise arm* • *n at baseline:* 185 • *Age mean:* 87.6 (SD 4.6) years • *Women (n (%)):* 100 (54.1) • *Barthel Index (0–100) on admission (mean):* 84 (SD 17) • *Confusion on admission – CAM (%):* 17 *Control arm* • *n at baseline:* 185 • *Age mean:* 87.1 (SD 5.2) years • *Women (n (%)):* 109 (58.9) • *Barthel Index (0–100) on admission (mean):* 83 (SD 17) • *Confusion on admission – CAM (%):* 12
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* multicomponent exercise. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* exercise training would increase recovery and physical capabilities. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* weight-training equipment, including 1 leg press machine, 1 bilateral knee extension machine, 1 seated bench press machine, dumbbells, ankle weights and handgrip balls.

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Martinez-Velilla 2019 *(Continued)*

- *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* supplementary material includes video of exercises. Exercises were adapted from the multicomponent physical exercise programme Vivifrail to prevent weakness and falls. The morning sessions included individualised supervised progressive resistance, balance and walking training exercises. Balance and gait retraining exercises gradually progressed in difficulty and included the following: semi-tandem foot standing, line walking, stepping practice, walking with small obstacles, proprioceptive exercises on unstable surfaces (foam pads sequence), altering the base of support, and weight transfer from 1 leg to the other. The evening session consisted of functional unsupervised exercises using light loads (i.e. 0.5–1 kg anklets and handgrip ball), such as knee extension and flexion, hip abduction and daily walking in the corridor of the acute care unit with a duration based on the clinical physical exercise guide Vivifrail.
- *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* 1 physiotherapist, and a researcher with a PhD background in exercise physiology.
- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* morning sessions were face-to-face with supervision from fitness specialist or physiotherapist. Evening sessions unsupervised.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* each session was performed in a room equipped ad hoc in the Acute Care of the Elderly unit.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* the intervention began when the clinician in charge of the participant considered that their haemodynamic situation was acceptable and the participant could collaborate. The intervention was programmed in 2 daily sessions (morning and evening) of 20 minutes' duration during 5–7 consecutive days (including weekends). The resistance exercises were tailored to the individual's functional capacity using variable resistance training machines aiming at 2–3 sets of 8–10 repetitions with a load equivalent to 30–60% of the 1-repetition maximum. Participants performed 3 exercises involving mainly lower-limb muscles (squats rising from a chair, leg press and bilateral knee extension) and 1 involving the upper body musculature. They were instructed to perform the exercises at a high speed to optimise muscle power output, and care was taken to ensure proper exercise execution.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* see items 4 and 8.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* adherence to the exercise intervention programme was documented in a daily register. A session was considered completed when ≥ 90% of the programmed exercises were successfully performed.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* the mean number of completed sessions per participant was 5 (SD 1) in the morning and 4 (SD 1) in the evening. Adherence to the intervention was 95.8% for the morning sessions (i.e. 806 successfully completed sessions of 841 total possible sessions) and 83.4% in the evening sessions (574 of 688 successfully completed sessions).

Control arm

- *TIDieR item 1:* usual care.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* usual care consists of standard PT focused on walking exercises for restoring the functionality conditioned by potentially reversible abnormalities.
- *TIDieR item 5:* not specified.
- *TIDieR item 6:* face-to-face.
- *TIDieR item 7:* Acute Care for Elders unit.
- *TIDieR item 8:* not specified.
- *TIDieR item 9:* not specified.

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- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* not specified.

Outcomes	Barthel Index (score 0–100) at T2 Short Physical Performance Battery at T2 Mini-Mental State Examination at T2 Incidence of delirium/confusion during hospitalisation EQ-5D at T2 Falls during hospitalisation Mortality during hospitalisation Medical deterioration during hospitalisation Length of hospital stay Readmissions within the first 3 months of discharge
Notes	*Unpublished data from email correspondence* *Barthel Index:* mean scores at discharge (T2): 84.5 (SD 14.5; 146 participants) for the intervention group and 78.2 (SD 19.5; 143 participant) for the control group. *Short Physical Performance Battery:* mean scores at discharge (T2): 6.79 (SD 3.21; 150 participants) for the intervention group and 4.91 (SD 2.89; 153 participants) for the control group. *Delirium:* 152 participants were assessed for delirium in the intervention group, 157 participants in the control group. EQ-5D: mean scores at discharge (T2): 69.5 (SD 18.8; 139 participants) in the intervention group and 57.5 (SD 20.6; 135 participants) for the control group. *Falls:* 0 falls/139 participants were recorded in the intervention group, 4 falls/146 participants were recorded in the control group. *Readmissions:* 29 participants were readmitted in the intervention group, 31 participants were readmitted in the control group.

McCullagh 2020

Study characteristics	
Methods	*Design:* RCT *Baseline time point (T1):* within the first 48 hours of admission to hospital *Outcome time point (T2):* within 24 hours of planned discharge from hospital *Follow-up time point (T3):* 2–3 months following discharge from hospital
Participants	*Inclusion criteria:* irrespective of ward allocation, medical inpatients aged ≥ 65 years, needing an aid or assistance to walk (or both) on admission, and admitted from and planned for discharge home (rather than for institutional care), with an anticipated hospital stay ≥ 3 days were recruited

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McCullagh 2020 *(Continued)*

Exclusion criteria: inpatients admitted for > 48 hours prior to screening; unable to follow simple commands in the English language; admitted with an acute psychiatric condition, or requiring end-of-life or critical care; ordered bedrest, or contraindications to walking (e.g. hip fracture or high ventricular rate atrial fibrillation); baseline Short Physical Performance Battery score 0/1; participated in the trial within the previous 12 months

Exercise arm

- *n at baseline:* 95
- *Age mean:* 79.7 (SD 7.5) years
- *Women (n (%)):* 61 (64)

Control arm

- *n at baseline:* 95
- *Age mean:* 81.7 (SD 7.3) years
- *Women (n (%)):* 29 (41)

Interventions

Exercise arm

- *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* augmented prescribed exercise programme + usual care.
- *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* it was hypothesised that a simple exercise programme could be easy to implement but effective in preventing acute sarcopenia, health and hospital outcomes.
- *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* the exercise intervention did not require specialist equipment and weights were not used due to infection control regulations.
- *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* the intervention group were assisted or supervised in complete strengthening, balance and gait exercises. Exercises were designed to improve the participant's transfer ability, balance and walking endurance. Strengthening and balance exercises were completed at the bedside. They were lower limb strengthening exercises completed in sitting, sit to stand exercises, transfer training (bed to chair, chair to chair) and balance exercises. The initial treatment was kept simple and straightforward to maintain participant compliance and the intensity was increased as tolerated in the subsequent sessions. Those able to walk safely and independently were strongly encouraged to walk ≥ 3 times daily independently. Family members were encouraged to "go for a walk" with the participants during visits. Advice and education about walking, general physical fitness and performance was given to the participants and their carers as required.
- *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* a senior physiotherapist who specialised in geriatric care prescribed the tailored exercise programme. The exercises were prescribed and assisted by her only.
- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* face-to-face, individual sessions, as well as in some cases encouragement to walk independently or with family members.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* all wards admitting older medical patients in a 350-bed general teaching hospital. Most of the exercise programme occurred on the participant's ward; however, participants could carry out the strengthening and balance exercises off the ward, in a quiet open area of the hospital.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* the sessions occurred twice daily, Monday to Friday, with session duration 20–40 minutes (depending upon the participant's exercise tolerance).

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McCullagh 2020 *(Continued)*

- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* the initial treatment was kept simple and straightforward to maintain participant compliance and the intensity was increased as tolerated in the subsequent sessions. Exercises were progressed by increasing the number of repetitions, increasing the speed and the challenge of the exercises.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* no protocol deviations relating to the intervention.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* the research physiotherapist kept a register of the exercises completed as well as the total number of sessions that the participants could have possibly completed, number that were actually completed and the reason for missed sessions such as absence from ward, refusal, medical status or care in isolation.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* 63/95 participants completed ≥ 75% of possible exercise sessions; 16/95 participants completed 50–74% of possible exercise sessions. 13/95 participants completed 25–49% of possible exercise sessions. 3/95 participants completed < 25% of possible exercise sessions.

Control arm

- *TIDieR item 1:* sham exercises + usual care.
- *TIDieR item 2:* to act as a control intervention.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* the control group completed sham exercises that mainly consisted of stretching and relaxation exercises. They were completed either in the lying or sitting position only. While the participants were encouraged to talk about their condition and exercise, none were given education, encouragement or were assisted to exercise or walk more. The exercises were not progressed but rather repeated at each session. Session duration 20–30 minutes depending on the participants' ability.
- *TIDieR item 5:* a senior physiotherapist who specialised in geriatric care prescribed the tailored exercise programme. The exercises were prescribed and assisted by her only.
- *TIDieR item 6:* face-to-face, individual sessions.
- *TIDieR item 7:* all wards admitting older medical patients in a 350-bed general teaching hospital.
- *TIDieR item 8:* the sessions occurred twice daily, Monday to Friday, with session duration 20–30 minutes (depending upon the participant's exercise tolerance).
- *TIDieR item 9:* the exercises were not progressed but rather repeated at each session.
- *TIDieR item 10:* no protocol deviations relating to the intervention.
- *TIDieR item 11:* the research physiotherapist kept a register of the exercises completed as well as the total number of sessions that the participants could have possibly completed, number that were actually completed and the reason for missed sessions such as absence from ward, refusal, medical status or care in isolation.
- *TIDieR item 12:* 57/95 participants completed ≥ 75% of possible exercise sessions; 18/95 participants completed 50–74% of possible exercise sessions. 14/95 participants completed 25–49% of possible exercise sessions. 5 participants completed < 25% of possible exercise sessions, 1 participant dropped out and did not receive the sham intervention.

Outcomes	Short physical performance battery at T2 and T3 6-Item Cognitive Impairment Test at T2 EQ-5D-5L VAS at T2 and T3 Falls during hospitalisation Length of hospital stay Mortality during hospitalisation Hospital readmissions in the 3 months following discharge

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Notes	There was a higher proportion of women in the intervention group (64%) compared to the control group (41%). The mean of the intervention group was 79.9 (SD 7.5) and the control group was 81.6 (SD 7.33) (P = 0.07). All multivariate analyses adjusted for age. *Unpublished data from email correspondence* *Delirium:* the number of participants with delirium at discharge that was not present at admission were 2 in the intervention group and 3 in the control group. *Length of hospital stay:* mean 9.88 (SD 7.12) days in the intervention group and 11.42 (SD 9.46) days in the control group.

McGowan 2018a

Study characteristics	
Methods	*Design:* RCT *Baseline time point (T1):* within 48 hours of admission *Outcome time point (T2):* day of discharge from hospital or day 7 of hospital admission if earlier
Participants	*Inclusion criteria:* aged > 65 years; admitted to hospital within the preceding 48 hours; able to sit in a chair independently and follow 1-stage commands; expected length of stay at least a further 48 hours *Exclusion criteria:* terminally ill or moribund; needing isolation precautions; bed bound prior to admission; who had a condition that made them unable to use the pedal exerciser (e.g. lower limb fracture, lower limb pain, leg amputation or foot deformity) *Exercise arm* • *n at baseline:* 24 • *Age mean:* 87.1 (SD 9.2) years • *Women (n (%)):* 16 (67) • *Barthel Index (0–20) on admission (mean):* 15.71 (SD 3.93) • *Diagnosis of dementia (n (%)):* 23.46 (4.85) *Control arm* • *n at baseline:* 24 • *Age mean:* 82.9 (SD 5.7) years • *Women (n (%)):* 13 (54) • *Barthel Index (0–20) on admission (mean):* 16.17 (SD 3.85) • *Diagnosis of dementia (n (%)):* 22.88 (6.33)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* chair-based pedal exercises. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* it was hypothesised that resistance training as part of pedal exercise may improve muscle strength and physical activity. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* Able2-pedal exerciser with pedometer (Able2 UK Ltd). • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* participants were asked

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McGowan 2018a *(Continued)*

to perform 5 minutes of chair-based pedal exercise 3 times per day with no specified targets on number of pedal revolutions using an Able2-pedal exerciser with pedometer.

- *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* the ward team would facilitate the pedal exercises and remind participants of it, but not be expected to remain with the participant throughout the exercise.
- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* as per item 5.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* 3 acute medical wards for older people.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* started in first 48 hours of admission, finished on day 7. 5 minutes of chair-based pedal exercise 3 times per day.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* none other than the intensity was driven by the participant.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* adherence was measured by time spent on the exerciser and total revolutions performed.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* the median number of revolutions cycled throughout the entire study period with the pedal exerciser was 152 (IQR 421, 43.5–464.5) revolutions. The median time spent on the pedal exerciser was 5.08 (IQR 18.02, 2.03–20.05) minutes across the whole study period.

Control arm

- *TIDieR item 1:* usual care.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* not specified.
- *TIDieR item 5:* not specified.
- *TIDieR item 6:* face-to-face.
- *TIDieR item 7:* 3 acute medical wards for older people.
- *TIDieR item 8:* not specified.
- *TIDieR item 9:* not specified.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* not specified.

Outcomes	Elderly Mobility Scale at hospital discharge Length of hospital stay
Notes	Intervention group was older (87 in intervention group vs 83 in control group) with a greater proportion of women (67% in intervention group vs 54% in control group).

Mudge 2008

Study characteristics	
Methods	*Design:* quasi-RCT

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Mudge 2008 *(Continued)*

	Baseline time point (T1): within 48 hours of admission to hospital *Outcome time point (T2):* within 48 hours of discharge from hospital
Participants	*Inclusion criteria:* aged ≥ 65 years, admitted to an internal medicine unit for ≥ 3 days and received at least some of their care on the designated intervention or control ward *Exclusion criteria:* already fully dependent before their admission; came from a high-level residential care facility or were medically too unstable for early assessment or terminally ill; discharged or transferred within 72 hours; died in hospital; or did not gain admission to study wards during their admission *Exercise arm* • *n at baseline:* 62 • *Age mean:* 81.7 (SD 7.8) years • *Women (n (%)):* 35 (56.6) • *Barthel Index (0–100) on admission (median):* 71.5 (IQR 58–83) • *Diagnosis of dementia (n (%)):* 6 (9.7) *Control arm* • *n at baseline:* 62 • *Age mean:* 82.4 (SD 7.4) years • *Women (n (%)):* 37 (59.7) • *Barthel Index (0–100) on admission (median):* 72.5 (IQR 56–85) • *Diagnosis of dementia (n (%)):* 5 (8.1)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* focused programme of physical exercise and cognitive stimulation + usual care. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* a multidisciplinary care model for general medical inpatients that was previously implemented demonstrated significant reductions in functional decline and inpatient mortality. Study authors aimed to assess whether the focused programme could further improve functional outcomes. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* the PT component included written advice about the exercise programme. A participant diary was provided to record daily activity. Ward nursing and multidisciplinary component included posters, and information resources including a walking map of ward and surrounds. • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* the intervention consisted of 3 components: a graduated exercise programme prescribed and supervised by the unit physiotherapist; education of ward and MDT staff, participants and carers to actively encourage mobility and functional independence; and a cognitive intervention delivered in groups by psychology students supervised by a senior psychologist. • *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* physiotherapist provided early review (within 48 hours), prescribed the exercise programme, and provided daily reviews as needed. Cognitive intervention delivered by psychology students under supervision of senior clinical psychologist. • *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* PT component was individual and face-to-face. Ward nursing and MDT component delivered both via face-to-face strategies (e.g. teaching) and using strategies such as posters. Cognitive component delivered via group sessions face-to-face. • *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* medical ward.

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Mudge 2008 *(Continued)*

- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* PT component started within first 48 hours. Bed, sitting, standing or ambulation-based exercises were performed twice daily (in addition to any specific recommendations by unit physiotherapist relating to presenting complaint). Ward nursing and MDT component described as 'intensive'. Cognitive component 3–4 afternoons per week.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* as per items 4, 5 and 8.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* participant activity on the ward was measured using direct observation. Participants were observed for 2- to 3-hour periods at varying times of the morning and afternoon shifts over 7 days. 76 patient-hours of observation were undertaken during each observation period, divided equally between the control and intervention ward. Time spent in bed, seated, standing and walking was recorded.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* in the intervention group, initial physiotherapist assessment and institution of an appropriate exercise programme was completed in a median of 2 days (IQR 0–4 days). More participants in the intervention group had a physiotherapist visit recorded (96.8% with intervention vs 82.3% with control), but there was no difference in mean number of physiotherapist visits per participant between groups (3.21 with intervention vs 3.37 with control; P = 0.53). 92% of participants in the intervention group received an exercise diary and made some record of exercise; about 33% completed their diary every day. 50% of the intervention group attended ≥ 1 cognitive group session. Observation of participant mobility in 34 elderly participants before the trial showed low levels of mobility on both trial wards, with < 10% of observed time spent standing or walking. During the intervention, participants on the intervention ward were much less likely to be observed in bed and spent significantly more time standing or walking within the ward.

Control arm

- *TIDieR item 1:* usual care.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* control group participants received usual care from the MDT, including daily discussion of participant progress and discharge plan, and referral to the team physiotherapist or OT by medical or nursing staff if there were concerns about mobility or function.
- *TIDieR item 5:* physiotherapists and other healthcare providers as required.
- *TIDieR item 6:* not specified.
- *TIDieR item 7:* medical ward.
- *TIDieR item 8:* not specified.
- *TIDieR item 9:* not specified.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* as per exercise group.
- *TIDieR item 12:* mobility patterns on the control ward were unchanged, with < 10% of observed time spent standing or walking.

Outcomes	Barthel Index (score of 0–100) at T2 Incidence of delirium during hospitalisation Falls during hospitalisation Mortality during hospitalisation Length of hospital stay Readmissions within 30 days of hospital discharge New institutionalisation at hospital discharge

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Mudge 2008 *(Continued)*

	Timed Up and Go at T2 (categorised scores only)
Notes	

Ortiz-Alonso 2020

Study characteristics	
Methods	*Design:* quasi-RCT *Baseline time point (T1):* admission to hospital *Outcome time point (T2):* discharge from hospital *Follow-up time point (T3):* 3 months after discharge
Participants	*Inclusion criteria:* aged > 75 years, admitted to an acute care of the elderly unit *Exclusion criteria:* non-ambulatory or dependent in all basic ADLs at baseline (i.e. 2 weeks before admission, as assessed by retrospective interview), had unstable cardiovascular disease or any other major medical condition contraindicating exercise, terminal illness, severe dementia (i.e. ≥ 8 errors in the Spanish version of the Short Portable Mental Status Questionnaire), an expected length of hospitalisation < 3 days, were transferred from another hospital unit or had a scheduled admission (which was usually associated with a length of hospitalisation < 3 days) *Exercise arm* • *n at baseline:* 143 • *Age mean:* 88 (SD 5) years • *Women (n (%)):* 86 (60) • *Diagnosis of dementia (n (%)):* 34 (27) *Control arm* • *n at baseline:* 125 • *Age mean:* 88 (SD 5) years • *Women (n (%)):* 68 (54) • *Diagnosis of dementia (n (%)):* 34 (27)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* inpatient exercise programme + usual care. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* exercise programmes believed to improve participants' functional status at discharge as well as to reduce the length and cost of hospital stays. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* no specialist exercise equipment. Exercise loads recorded in a notebook. • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* supervised exercises 1–3 times per day. Exercises were rising from a seated to an upright position (using armrests/assistance if necessary) in the participant's room and supervised walking exercises along the corridor of the ward. Standing and walking exercises were separated by a rest period of up to 5 minutes. Videos of exercise sessions available via supplementary material. • *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* exercise sessions were supervised by 1 of 2 fitness specialists.

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Ortiz-Alonso 2020 *(Continued)*

- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* face-to-face, individually.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* acute care of the elderly unit.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* exercise sessions began day after admission. 1–3 sessions per day on weekdays only (approximately 20 minutes in total each day). Participants began with 1 session per day and this increased to 3 sessions depending on participants physical capacity. Sit-to-stand exercise from a chair: maximum of 10 repetitions and 1–3 sets, depending on the participant's physical capacity. Walking exercise duration 3–10 minutes depending on the participant's physical capacity.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* as item 8.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* training loads were recorded in a notebook.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* participants in the intervention group performed a median of 3 training days (IQR 2) and 2 training sessions per day (IQR 2), with a mean total exercise time per day of 20 minutes (for each session, the median duration of the walking section was 5 minutes (IQR 4, range 0–10), and participants performed a mean of 9 (SD 6, range 0–30) sit-to-stands).

Control arm

- *TIDieR item 1:* usual care.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* not specified.
- *TIDieR item 5:* not specified.
- *TIDieR item 6:* not specified.
- *TIDieR item 7:* acute care of the elderly unit.
- *TIDieR item 8:* not specified.
- *TIDieR item 9:* not specified.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* not specified.

Outcomes	ADL (score 0–6) at T2 and T3 Short Physical Performance Battery at T2 Functional Ambulatory Category at T2 and T3 Mortality during hospitalisation Falls Length of hospital stay Readmissions within 3 months of hospital discharge
Notes	Intervention group had higher proportion of participants with a diagnosis of dementia (27% in intervention vs 12% in control), depression (32% in intervention vs 18% in control), history of falls (36% in intervention vs 16% in control), lower mean baseline ADL scores (4.0 in intervention vs 4.6 in control) and admission ADL scores (2.3 in intervention vs 3.1 in control).

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Pedersen 2019

Study characteristics	
Methods	*Design:* RCT *Baseline time point (T1):* admission to hospital *Outcome time point (T2):* within the first week after discharge from hospital *Follow-up time point (T3):* 4 weeks after discharge and 6 months after discharge
Participants	*Inclusion criteria:* aged ≥ 65 years, admitted with acute illness from their own home to the emergency department of hospital *Exclusion criteria:* terminal illness; in treatment for diagnosed cancer; diagnosis of COPD and participation in a COPD rehabilitation programme; living outside the 3 included municipalities; inability to speak or understand Danish; inability to cooperate in tests/exercises; transfer to the intensive care unit; isolation-room stay; expected hospitalisation lasting < 24 hours; inability to stand *Exercise arm* • *n at baseline:* 42 • *Age mean:* 82.1 (SD 7.4) years • *Women (n (%)):* 30 (71.4) • *Barthel Index (0–20) on admission (median):* 20 (IQR 19–20) *Control arm* • *n at baseline:* 43 • *Age mean:* 82.5 (SD 7.5) years • *Women (n (%)):* 26 (60.5) • *Barthel Index (0–20) on admission (median):* 20 (IQR 19–20)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* progressive strength training and protein supplementation + usual care. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* it was hypothesised that strength training and protein supplementation would prevent functional deterioration and muscle wasting during illness. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* written exercise training and progression protocol was used. After each training session, participants were asked to consume a protein supplement (Nutridrink Compact Protein from Nutricia A/S) containing milk-based protein 18 g and 300 kcal. Weight vest (Titan Box 1–30 kg), and weight cuffs were used for some exercises. • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* training sessions were delivered every weekday during hospitalisation and 3 days per week for 4 weeks in their own home after discharge. Every training session consisted of a warm-up programme for the lower extremities followed by 2 progressive strength training exercises, a sit-to-stand exercise followed by a heel raise exercise. Both exercises followed predefined models of progression allowing for performance of the exercise from a seated position to performing the exercise unilaterally with extra load. • *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* training sessions were delivered by physiotherapists (2 physiotherapists with 3 years of experience supervised in hospital exercise, 5 physiotherapists with 4–15 years of experience supervised the home-based exercises). The primary investigator performed preintervention meetings with all physiotherapists. Training covered both the warm-up programme and the strength training protocol. If physiotherapists who were deliv-

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Pedersen 2019 *(Continued)*

ering the intervention had questions that arose during the study they could contact a senior physiotherapist.

- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* training sessions were delivered face-to-face 1:1.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* training sessions occurred in the hospital in the participants' bedrooms and in the participants own home for 4 weeks after discharge.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* during hospitalisation, participants were seen every weekday. After discharge participants were seen 3 times per week for 4 weeks (maximum 12 sessions over 5 weeks) in their own homes. Participants were asked to perform 3 sets of 12 repetitions of each exercise. Exercises were designed to correspond to 60–70% of a 1 repetition maximum.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* exercises were progressed/regressed based on number of repetitions achieved in each exercise session (> 8 repetitions = progression, < 8 repetitions = regression) as per protocol.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* no modifications reported.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* the supervising physiotherapist completed an exercise diary consisting of information about the level of exercise attained according to the progression models, the extra load added (kg), and the number of sets and repetitions performed at each level. The physiotherapist registered reasons for non-participation and the amount of protein consumed after each training session. High compliance was defined as completion of 80% of training sessions with a minimum of 2 sets performed each session.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* significant dropout rate during study. 78.8% of participants started the intervention between 0 and 2 days after admission (range 0–4). Overall, 43% (18/42) of participants randomised to the intervention group were very compliant with the intervention. Of those who remained in the study at 4 weeks, 60% (18/30) were very compliant and 23% (7/30) were moderately compliant with the intervention (minimum 8/12 (67%) sessions performed with 2 sets of 8 repetition maximums). All participants consumed the amount of protein stated in the protocol. Between week 1 and week 4 of the intervention, there was a general increase in the level of exercise performed in both the sit-to-stand exercise and the heel-raise exercise. Thus, in the sit-to-stand exercise, 20% more participants trained at levels 6–7 in week 4 compared to week 1, and in the heel-raise exercise, 24% more participants trained at levels 5–7 in week 4 compared to week 1. Also, in both exercises, those training with a weighted vest increased their load by 1.5 kg ($P < 0.01$) for sit-to-stand level 6 and 2 kg ($P < 0.01$) for heel-raise level 5.

Control arm

- *TIDieR item 1:* usual care.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* standard care as per hospital. National targets to assess function and nutrition and make an appropriate plan within 24–48 hours of admission. Rehabilitation often starts during hospitalisation and continues after discharge.
- *TIDieR item 5:* not specified.
- *TIDieR item 6:* not specified.
- *TIDieR item 7:* acute medical ward and internal medicine ward.
- *TIDieR item 8:* not specified.
- *TIDieR item 9:* not specified.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* not specified.

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Pedersen 2019 *(Continued)*

Outcomes	Barthel Index (score of 0–20) at T2 and T3 de Morton Mobility Index at T2 and T3 Mortality during hospitalisation Adverse events (composite score) during hospitalisation Length of hospital stay Readmissions within first 4 weeks and first 6 months after discharge (numbers not reported) Walking speed at T2 and T3
Notes	Intervention group had higher percentage of women (71.4% in intervention vs 60.5% in control). *Unpublished data from email correspondence* *Hospital readmissions:* at 4 weeks' follow-up (T3), 8/43 participants of intervention group vs 6/42 participants of control group had been readmitted.

Sahota 2017

Study characteristics	
Methods	*Design:* RCT *Baseline time point (T1):* within 36 hours of admission to hospital *Outcome time point (T2):* within the first week after discharge from hospital *Follow-up time point (T3):* 91 days after discharge
Participants	*Inclusion criteria:* aged ≥ 70 years; general practitioner registered within the Nottingham City Clinical Commissioning Group's catchment area only (UK) *Exclusion criteria:* bed bound prior to admission or moribund on admission; receiving palliative care; previously included in the trial on an earlier admission; unable to be screened and recruited by the research team within 36 hours of admission to the study ward; nursing home residents *Exercise arm* • *n at baseline:* 125 • *Age mean:* 83.6 (SD 6.6) years • *Women (n (%)):* 82 (66) • *Barthel Index (0–20) on admission (mean):* 11.0 (SD 6.1) *Control arm* • *n at baseline:* 125 • *Age mean:* 84.5 (SD 5.9) years • *Women (n (%)):* 79 (63) • *Barthel Index (0–20) on admission (mean):* 10.5 (SD 5.4)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* CIRACT service.

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Sahota 2017 *(Continued)*

- *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* CIRACT service aims to facilitate seamless care for patients on discharge from hospital and prevent avoidable hospital readmissions.
- *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* none specified.
- *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* following randomisation, the CIRACT service undertook a comprehensive assessment of the participant's ability to perform certain tasks and formed a rehabilitation plan. While in hospital participants were treated daily and the duration of rehabilitation they received depended on their needs. During the participant's hospital stay, the team liaised with the participant and their carer(s) to visit the participant's home to assess and provide recommendations for equipment and make adaptations or modifications (or both) as required. In more complex cases, the CIRACT team took the participant out of the hospital for a home visit prior to discharge. Following discharge, the CIRACT team visited the participant at home to assess the level of rehabilitation required, further follow-up visits as deemed necessary and appropriate referral to additional community services.
- *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* the CIRACT service consisted of a senior occupational therapist (transition coach), senior physiotherapist and assistant practitioner linked directly to a social services practitioner.
- *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* as item 4.
- *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* general medical elderly care wards.
- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* after randomisation (first 36 hours of hospitalisation), participants were treated daily if appropriate. Duration of rehabilitation based on their needs.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* as item 4 and 8.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* not specified.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* there were 15 protocol deviations in the CIRACT group.

Control arm

- *TIDieR item 1:* usual care (THB-Rehab).
- *TIDieR item 2:* ward therapy teams – senior OT and senior PT weekdays only. Provided assessment and recommendations for rehabilitation. Referred to community-based services and rehabilitation on discharge.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* the standard THB-Rehab service was on weekdays only. The service referred the participants to the appropriate community-based services for provision of equipment at home, personal care and ongoing rehabilitation where appropriate at discharge. Once discharged from hospital, the participant had no direct contact with the THB-Rehab service but where referred, continued further rehabilitation with community services.
- *TIDieR item 5:* the standard THB-Rehab service was provided by the ward therapy teams (usually a senior OT and a senior physiotherapist).
- *TIDieR item 6:* as item 4.
- *TIDieR item 7:* general medical elderly care wards.
- *TIDieR item 8:* 5 days per week.
- *TIDieR item 9:* as item 4.

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Sahota 2017 *(Continued)*

- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* there were 8 protocol deviations in the THB-Rehab group.

Outcomes	Barthel Index (score of 0–20) at T3 only EQ-5D-3L at T3 only Falls Mortality during hospitalisation Length of hospital stay Hospital readmissions in the first 28 after hospital discharge.
Notes	

Slaets 1997

Study characteristics	
Methods	*Design:* quasi-RCT *Baseline time point (T1):* admission to hospital *Outcome time point (T2):* discharge from hospital *Follow-up time point (T3):* 6 months (readmissions)
Participants	*Inclusion criteria:* aged ≥ 75 years, and referred to department of general medicine *Exclusion criteria:* admitted for day treatment *Exercise arm* • *n at baseline:* 140 • *Age mean:* 82.5 (SD 4.9) *years* • *Women (n (%)):* 94 (67.1) *Control arm* • *n at baseline:* 97 • *Age mean:* 83.2 (SD 5.1) years • *Women (n (%)):* 73 (75.3)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* multidisciplinary joint treatment by geriatric team + usual care. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* psychogeriatric disciplinary intervention hypothesised to improve hospital and functional outcomes. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers):* not specified. • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* MDT consisted of a geriatrician, specialised geriatric liaison nurse and a physiotherapist. Staff-to-participant ratio was increased by 3 nurses. The main task of the team was assessment on admission, generating and implementing

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Slaets 1997 *(Continued)*

	the treatment plans, and planning and management of discharge. Intervention included daily PT assessment. A weekly MDT meeting was held, attended by the geriatric team, nurses, social worker, dietitian, psychiatrist and other occasionally invited consultants. The geriatrician was present at the weekly ward rounds with the attending physician and the 2 resident physicians. In addition, the geriatric team had their own ward rounds every week. • *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* MDT consisted of a geriatrician, specialised geriatric liaison nurse and a physiotherapist. The geriatrician was also trained in geriatric psychiatry. • *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* most physiotherapists' time was in direct contact with participants on the ward. The geriatrician spent approximately 2 hours per day in direct contact with participants or their family members. • *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* general medical unit. • *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* as item 4: daily multidisciplinary input. • *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* as item 4. • *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified. • *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* not specified. • *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* not specified. *Control arm* • *TIDieR item 1:* usual care. • *TIDieR item 2:* not specified. • *TIDieR item 3:* not specified. • *TIDieR item 4:* not specified. • *TIDieR item 5:* not specified. • *TIDieR item 6:* care provided by staff in another general medical unit, who were not involved in the intervention unit. • *TIDieR item 7:* general medical unit. • *TIDieR item 8:* not specified. • *TIDieR item 9:* not specified. • *TIDieR item 10:* not specified. • *TIDieR item 11:* not specified. • *TIDieR item 12:* not specified.
Outcomes	ADL (score of 0–7) at T2 (categorised only) Help index (score of 0–12) at T2 (categorised only) Mobility (score of 0–4) at T2 (categorised only) Length of hospital stay Readmissions within first 6 months of discharge from hospital Mortality during hospitalisation
Notes	There were more women in intervention group (75.3%) than in the control group (67.1%). Participants were more likely to be married in the intervention group (43.6%) than the control group (27.8%).

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Zelada 2009

Study characteristics	
Methods	*Design:* quasi-RCT *Baseline time point (T1):* within 72 hours of admission *Outcome time point (T2):* day of discharge
Participants	*Inclusion criteria:* aged ≥ 65 years and admitted for an acute medical pathology to a geriatric care unit *Exclusion criteria:* dependent in all basic ADL before admission; admitted to intensive care; transferred from other services; intubated patients; severe dementia; terminal cancer; severe aphasia; discharged in < 24 hours; admitted for specific procedures; patients from the internal medicine service to the geriatric care team for treatment *Exercise arm* • *n at baseline:* 68 • *Age mean:* 42 (SD 56) years • *Women (n (%)):* 42 (61.8%) *Control arm* • *n at baseline:* 75 • *Age mean:* 76.1 (SD 7.2) years • *Women (n (%)):* 42 (56%)
Interventions	*Exercise arm* • *TIDieR item 1: (brief name: provide the name or a phrase that describes the intervention):* geriatric care unit. • *TIDieR item 2: (why: describe any rationale, theory or goal of the elements essential to the intervention):* it was hypothesised that the geriatric care unit could favour a reduction in the incidence of functional decline with a favourable impact on quality of life without an increase in care costs. • *TIDieR item 3: (what (materials): describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers): n*ot specified. • *TIDieR item 4: (what (procedures): describe each of the procedures, activities or processes (or a combination) used in the intervention, including any enabling or support activities):* based on protocol of Landefeld and colleagues 1995. Medical interventions included: geriatric assessment upon admission, evaluation of problems, early removal of endovenous and urinary catheters, prevention and early diagnosis of adverse events, early discharge planning and the co-ordination of the continuity of treatment at an appropriate level. Multidisciplinary interventions included: functional evaluation, early rehabilitation, promotion of self-care, neurosensory stimulation, orientation for the family or carer (or both). Nursing interventions included: incontinence management, prevention of pressure ulcers and promotion of self-care. Furthermore, an interdisciplinary meeting was set up once per week (with the chief physician, resident, therapists and a social worker); daily information, education and active participation by family or carer. • *TIDieR item 5: (who provided: for each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given):* 1 geriatric physician, 1 medical resident of the speciality, general care nurses, a physiotherapist, an OT and a social worker (once per week). • *TIDieR item 6: (how: describe the modes of delivery (such as face-to-face or by some other mechanism, such as Internet or telephone) of the intervention and whether it was provided individually or in a group):* face-to-face. • *TIDieR item 7: (where: describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features):* the geriatric unit contained 10 beds.

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Zelada 2009 *(Continued)*

- *TIDieR item 8: (when and how much: describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose):* as item 4.
- *TIDieR item 9: (tailoring: if the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how):* not specified.
- *TIDieR item 10: (modifications: if the intervention was modified during the course of the study, describe the changes (what, why, when and how)):* not specified.
- *TIDieR item 11: (how well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them):* not specified.
- *TIDieR item 12: (how well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned):* not specified.

Control arm

- *TIDieR item 1:* usual care.
- *TIDieR item 2:* not specified.
- *TIDieR item 3:* not specified.
- *TIDieR item 4:* routine medical care and nursing care, typical for an acute care unit – this was a different hospital unit as the comparison at the same time as the other site.
- *TIDieR item 5:* internist physician, a medical resident to this speciality, general care nurses, access to PT and OT and a social worker by means of referral.
- *TIDieR item 6:* face-to-face.
- *TIDieR item 7:* acute medical unit.
- *TIDieR item 8:* not specified.
- *TIDieR item 9:* not specified.
- *TIDieR item 10:* not specified.
- *TIDieR item 11:* not specified.
- *TIDieR item 12:* not specified.

Outcomes	Katz ADL (score 0–6) at T2 (categorised scores only) Length of hospital stay
Notes	Intervention group was older (79.6 years in intervention vs 76.1 years in control), was more likely to be admitted with renal conditions (14.7% in intervention vs 6.7% in control) and less likely to have cardiovascular problems (9.9% in intervention vs 25.3% in control).

ADL: activities of daily living; AGW: acute geriatric ward; CAM: Confusion Assessment Method; CGA: comprehensive geriatric assessment; CI: confidence interval; CIRACT: Community In-Reach and Care Transition; COPD: chronic obstructive pulmonary disease; EQ-5D: EuroQol 5 Dimensions; EQ-5D-5L: EuroQol 5 Dimensions 5 Levels; IADL: Instrumental Activities of Daily Living; IQR: interquartile range; MDT: multidisciplinary team; n: number; NA: not applicable; OT: occupational therapy; PT: physiotherapy; RCT: randomised controlled trial; SD: standard deviation; T: time point (e.g. T1: time point 1); THB-Rehab: traditional hospital-based rehabilitation service; VAS: visual analogue scale.

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Ahn 2018	Critical care setting
Barnes 2012	Exercise not part of the intervention
Braun 2019	Participants randomised after 72 hours of hospital admission
Brown 2006	No outcome data

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Study	Reason for exclusion
Bruun 2020	Community setting
Buhl 2016	Exercise intervention started after discharge from hospital
Collard 1985	Non-general medical population
Cumming 2008	Non-general medical population
DRKS00011262	Participants randomised after 72 hours of hospital admission
Fleck 2012	Protocol, full manuscript identified
Fleiner 2017	Non-general medical population
Gade 2019	Control group received additional exercise
Greening 2014	Non-general medical population
Haines 2004	Inpatient rehabilitation setting
Haines 2007	Inpatient rehabilitation setting
Hamilton 2018	Abstract/letter to editor, full manuscript identified
Hamilton 2019	< 95% of the study participants were aged ≥ 65 years
Harris 1991	Exercise not part of the intervention
Hegerova 2015	Did not measure outcomes at time points of interest.
Heim 2017	Non-general medical population
Hochstetter 2005	< 95% of the study participants were aged ≥ 65 years
José 2016	< 95% of the study participants were aged ≥ 65 years
JPRN-UMIN000019551	Non-general medical population
JPRN-UMIN000030036	Non-randomised study
Kim 2013	Inpatient rehabilitation setting
Kirk 2018	Protocol, full manuscript identified
Latham 2001	Inpatient rehabilitation setting
Lopez-Lopez 2019	Non-general medical population
Mallery 2003	Participants randomised after 72 hours of hospital admission
Martinez-Velilla 2017	Abstract/letter to editor, full manuscript identified
McGowan 2018b	Abstract/letter to editor, full manuscript identified
Mills 2019	Abstract/letter to editor, full manuscript not identified

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Study	Reason for exclusion
Mudge 2007	Abstract/letter to editor, full manuscript identified
Mudge 2019	Abstract/letter to editor, full manuscript not identified
Mundy 2003	< 95% of the study participants were aged ≥ 65 years
NCT00038155	Protocol, full manuscript identified
NCT01483456	Non-randomised study
NCT02062541	Community setting
NCT03558841	Inpatient rehabilitation setting
NCT04565626	Protocol, < 95% of the study participants expected to be aged ≥ 65 years
Netz 1994	Inpatient rehabilitation setting
Neumeier 2017	< 95% of the study participants were aged ≥ 65 years
O'Shaughnessy 2019	Exercise not part of the intervention
Peel 2016	Inpatient rehabilitation setting
Peyrusqué 2021	Abstract/letter to editor, full manuscript not identified
Pires 2020	Inpatient rehabilitation setting
Pitkala 2006	Exercise not part of the intervention
Raymond 2017	Participants randomised after 72 hours of hospital admission
Rodrigues 2019	Non-randomised study
Rubenstein 1984	Participants randomised after 72 hours of hospital admission
Sáez de Asteasu 2021b	Abstract/letter to editor, full manuscript identified
Said 2012	Inpatient rehabilitation setting
Saltvedt 2002	Participants randomised after 72 hours of hospital admission
Saltvedt 2004	Participants randomised after 72 hours of hospital admission
Saltvedt 2006	Participants randomised after 72 hours of hospital admission
Schwenk 2014	Inpatient rehabilitation setting
Seo 2019	Community setting
Siebens 2000	Non-general medical population
Steadman 2003	Community setting
Steunenberg 2016	Non-randomised study

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Study	Reason for exclusion
Sullivan 2007	Community setting
Tibaek 2014	Inpatient rehabilitation setting
Timonen 2002	Exercise intervention started after discharge from hospital
Timonen 2006	Exercise intervention started after discharge from hospital
Treacy 2015a	Abstract/letter to editor, full manuscript identified
Treacy 2015b	Inpatient rehabilitation setting
Trombetti 2013	Inpatient rehabilitation setting
Vidan 2009	Non-randomised study
Weatherall 2004	Inpatient rehabilitation setting
Yoo 2013	Exercise not part of the intervention

Characteristics of studies awaiting classification *[ordered by study ID]*

Kojaie-Bidgoli 2021

Methods	*Design:* randomised controlled trial *Baseline time point (T1):* admission to hospital *Outcome time point (T2):* discharge from hospital
Participants	*Inclusion criteria:* aged ≥ 70 years who are admitted to the internal medicine wards, with ≥ 1 risk factor for delirium at admission (visual impairment, hearing impairment, cognitive impairment, impaired sleep, mobility impairment or dehydration). Expected length of stay > 7 days; able to communicate verbally or in writing *Exclusion criteria:* diagnosis of delirium at hospital admission, coma, mechanical ventilation, aphasia (expressive or receptive), severely impaired communication ability, terminal/end-stage conditions, imminent death, combative or dangerous behaviours, a severe psychotic disorder that prevents from participation in interventions, severe dementia (being unable to communicate based on Short Portable Mental Status Questionnaire 10 errors), airborne precautions (e.g. tuberculosis), being isolated, droplet precautions (e.g. influenza), neutropenic precautions, being discharged around 48 hours after admission, refusal to participate in study, and patient's family members or physician's refusal to allow participation in study in the case of incompetent patients
Interventions	Intervention: care programme based on the Hospitalized Elder Life Program (HELP) provided by nursing students. The intervention includes an early mobilisation programme in which all patients will be enrolled. The mobilisation programme includes ambulation or active range-of-motion exercises 3 times daily. Control group: usual care consisting of standard hospital care for the setting, provided by physicians, nurses and support staff (e.g. dietitians, physiotherapists).
Outcomes	Incidence of delirium (as assessed with the Confusion Assessment Method tool) Independence with activities of daily living using the Barthel Index Number of falls during hospitalisation.

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Kojaie-Bidgoli 2021 *(Continued)*	
	Mortality
Notes	en.irct.ir/trial/33830

Characteristics of ongoing studies *[ordered by study ID]*

NCT03604640

Study name	Physical Training and Health Education in Hospitalized Elderly
Methods	*Design:* randomised controlled trial *Baseline time point (T1):* day of hospital admission *Outcome time point (T2):* day of hospital discharge *Follow-up time point (T3):* 3 months after hospital discharge
Participants	*Inclusion criteria:* aged ≥ 75 years, admitted into the Geriatrics Department of the Hospital General Universitario Gregorio Marañón (Madrid, Spain); able to ambulate, with or without personal/technical assistance; able to communicate; provide informed consent *Exclusion criteria:* duration of hospitalisation < 72 hours; any factor precluding performance of the physical training programme or testing procedures as determined by the attending physician (including but not limited to: terminal illness, incapable of ambulation, unstable cardiovascular disease or other medical condition, severe dementia, unwillingness to either complete the study requirements or to be randomised into control or intervention group)
Interventions	*Exercise arm:* training programme (30 minutes per session, 2 sessions per day, lower limb strength training, balance training, walking and inspiratory muscle training) and also health education. Health education consists of several informational activities. Each activity session will teach the patient and carer how to perform the exercises to ensure they will continue to be performed at home and before discharge the entire session will be devoted to reviewing the entire programme. The type, frequency and progression of the exercises to be carried out will be reviewed; they will be explained how to perform them at home and given personalised written instructions with illustrations of the exercises. Also, after 1 and 2 months of discharge, the professional with whom they have completed the training will call them to insist on the completion of the programme or to clarify any doubts that may exist *Control arm:* usual care for the setting
Outcomes	Independence with ADL (range 0–6) at T3 Barthel Index at T3 Functional Ambulation Classification at T3 Short Physical Performance Battery at T2 Alusti Test at T2
Starting date	July 2018
Contact information	Dr Jose Antonio joseantonio.serra@salud.madrid.org
Notes	clinicaltrials.gov/ct2/show/NCT03604640

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NCT04600453	
Study name	Prevention of functional and cognitive impairment through a multicomponent exercise program in hospitalized elderly
Methods	*Design:* randomised controlled trial *Baseline time point (T1):* admission to hospital *Outcome time point (T2):* discharge from hospital *Follow-up time point (T3):* 3 years after hospital discharge
Participants	*Inclusion criteria:* aged > 75 years; Barthel Index ≥ 60 points; able to ambulate (with/without assistance); provide informed consent; able to communicate *Exclusion criteria:* expected length of stay < 6 days; terminal illness; very severe cognitive decline (i.e. Global Deterioration Scale 7); uncontrolled arrhythmias, acute pulmonary embolism and myocardial infarction, or extremity bone fracture in the past 3 months *Target sample size:* 240
Interventions	*Exercise arm:* multicomponent exercise training programme composed of supervised progressive resistance exercise training, balance-training and walking for 4 consecutive days. During the training period, participants will be trained in 20-minute sessions twice per day (morning and evening). The supervised multicomponent exercise training programme will comprise upper and lower body strengthening exercises, tailored to the individual's functional capacity, using weight machines and aiming for 2–3 sets of 8–10 repetitions at an intensity of 40–60% of 1 repetition maximum combined with balance and gait retraining exercises that progressed in difficulty and functional exercises, such as rises from a chair. The second part of the session will consist of functional exercises such as knee extension and flexion, hip abduction, balance movements, and daily walking in the hospital *Control arm:* usual care for setting
Outcomes	Short Physical Performance Battery EuroQol-5 Dimension (EQ-5D) visual analogue scale Incidence of delirium as assessed with the Confusion Assessment Method 3-year mortality Total use of health-related resources (number of readmissions, visits to accident and emergency department, visits to outpatient clinics)
Starting date	October 2020
Contact information	Nicolas Martinez Velilla nicolas.martinez.velilla@cfnavarra.es
Notes	clinicaltrials.gov/ct2/show/NCT04600453

ADL: activities of daily living.

RISK OF BIAS

Legend: Low risk of bias High risk of bias Some concerns

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Risk of bias for analysis 1.1 Functional ability: independence with activities of daily living at discharge from hospital

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Subgroup 1.1.1 Rehabilitation-related activities						
Abizanda 2011	✓	✓	✓	✓	✓	✓
Counsell 2000	✓	~	✓	✗	~	✗
Ekerstad 2017	✗	✓	✓	✗	~	✗
Landefeld 1995	~	✓	✓	✗	~	✗
Subgroup 1.1.2 Structured exercise						
Blanc-Bisson 2008	~	✓	✗	✗	~	✗
Brown 2016	✓	✓	✓	✓	✓	✓
Gazineo 2021	✓	✓	✓	✗	~	✗
Hu 2020	✓	✓	✗	✓	~	✗
Killey 2006	✗	✗	~	✗	~	✗
Subgroup 1.1.3 Progressive resistance exercise						
de Morton 2007	✓	✓	~	✗	~	✗
Jeffs 2013	✓	✓	✓	✓	~	~
Jones 2006	✓	✓	~	✓	~	~
Martinez-Velilla 2019	✓	✓	~	✓	✓	~
Mudge 2008	✗	✓	✓	✓	~	✗
Ortiz-Alonso 2020	✗	✓	✓	✗	✓	✗
Pedersen 2019	✓	✓	✗	✓	✓	✗

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Risk of bias for analysis 1.2 Functional ability: functional mobility at discharge from hospital

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Subgroup 1.2.1 Rehabilitation-related activities						
Counsell 2000	✓	~	✓	✗	~	✗
Subgroup 1.2.2 Structured exercise						
Gazineo 2021	✓	✓	✓	✗	~	✗
McGowan 2018a	✓	✓	✓	✗	✓	✗
Subgroup 1.2.3 Progressive resistance exercise						
de Morton 2007	✓	✓	~	✗	~	✗
Martinez-Velilla 2019	✓	✓	~	✓	✓	~
McCullagh 2020	✓	✓	✓	✓	✓	✓
Ortiz-Alonso 2020	✗	✓	✓	✗	✓	✗
Pedersen 2019	✓	✓	✗	✓	✓	✗

Risk of bias for analysis 1.3 Functional ability: new incidence of delirium during hospitalisation

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Subgroup 1.3.1 Rehabilitation-related activities						
Abizanda 2011	✓	✓	✓	✓	✓	✓
Asplund 2000	✓	~	✓	✗	~	✗
Subgroup 1.3.2 Structured exercise						

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	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Brown 2016	✓	✓	✓	✗	~	✗
Subgroup 1.3.3 Progressive resistance exercise						
Jeffs 2013	✓	✓	✓	✓	~	~
Martinez-Velilla 2019	✓	✓	~	✓	✓	~
McCullagh 2020	✓	✓	✓	✓	✓	✓
Mudge 2008	✗	✓	✓	✓	~	✗

Risk of bias for analysis 1.4 Quality of life at discharge from hospital

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Subgroup 1.4.1 Rehabilitation-related activities						
Ekerstad 2017	✗	✓	✓	✗	~	✗
Subgroup 1.4.2 Structured exercise						
Hu 2020	✓	✓	✗	✓	~	✗
Subgroup 1.4.3 Progressive resistance exercise						
Martinez-Velilla 2019	✓	✓	~	✓	✓	~
McCullagh 2020	✓	✓	✓	✓	✓	✓

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Risk of bias for analysis 1.5 Falls during hospitalisation

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Subgroup 1.5.1 Rehabilitation-related activities						
Sahota 2017	~	✓	✓	✓	~	~
Subgroup 1.5.2 Structured exercise						
Brown 2016	✓	✓	✓	✓	✓	✓
Gazineo 2021	✓	✓	✓	✓	~	~
Killey 2006	✗	✗	✓	✓	~	✗
Subgroup 1.5.3 Progressive resistance exercise						
de Morton 2007	✓	✓	✓	✓	~	~
Jones 2006	✓	✓	✓	✓	~	~
Martinez-Velilla 2019	✓	✓	✓	✓	✓	✓
McCullagh 2020	✓	✓	✓	✓	✓	✓
Mudge 2008	✗	✓	✓	✓	~	✗

Risk of bias for analysis 1.6 Medical deterioration during hospitalisation

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Subgroup 1.6.1 Rehabilitation-related activities						
Abizanda 2011	✓	✓	✓	✓	✓	✓
Asplund 2000	✓	~	✓	✗	~	✗
Subgroup 1.6.2 Structured exercise						

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	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Brown 2016	✓	✓	✓	✓	✓	✓
Hu 2020	✓	✓	✓	✓	~	~
Subgroup 1.6.3 Progressive resistance exercise						
de Morton 2007	✓	✓	✓	✓	~	~
Jeffs 2013	✓	✓	✓	✓	~	~
Jones 2006	✓	✓	✓	✓	~	~
Martinez-Velilla 2019	✓	✓	✓	✓	✓	✓
McCullagh 2020	✓	✓	✓	✓	✓	✓
Mudge 2008	✗	✓	✓	✓	✓	✗
Pedersen 2019	✓	✓	✓	✓	✓	✓

Risk of bias for analysis 2.2 Hospital length of stay (days)

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Subgroup 2.2.1 Rehabilitation-related activities						
Abizanda 2011	✓	✓	✓	✓	✓	~
Asplund 2000	✓	~	✓	✓	~	~
Counsell 2000	✓	~	✓	✓	~	~
Ekerstad 2017	✗	✓	✓	✓	✓	✗

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	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Fretwell 1990	~	~	✓	✓	~	~
Landefeld 1995	~	✓	✓	~	~	~
Sahota 2017	~	✓	✓	✓	~	~
Slaets 1997	~	✓	✓	✓	~	~
Zelada 2009	✗	✓	✓	✓	~	✗
Subgroup 2.2.2 Structured exercise						
Brown 2016	✓	✓	✓	✓	✓	✓
Gazineo 2021	✓	✓	✓	✓	~	~
Hu 2020	✓	✓	✓	✓	~	~
McGowan 2018a	✓	✓	✓	✓	✓	✓
Subgroup 2.2.3 Progressive resistance exercise						
Courtney 2009	✓	✓	✓	✓	~	~
de Morton 2007	✓	✓	✓	✓	~	~
Jeffs 2013	✓	✓	✓	✓	~	~
Jones 2006	✓	✓	✓	✓	~	~
Martinez-Velilla 2019	✓	✓	✓	✓	✓	✓
McCullagh 2020	✓	✓	✓	✓	✓	✓
Mudge 2008	✗	✓	✓	✓	~	✗
Ortiz-Alonso 2020	✗	✓	✓	✓	✓	✗

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	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Pedersen 2019	✓	✓	✓	✓	✓	✓

Risk of bias for analysis 2.3 New institutionalisation at hospital discharge

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Subgroup 2.3.1 Rehabilitation-related activities						
Asplund 2000	✓	~	✓	✓	~	~
Counsell 2000	✓	~	✓	✓	~	~
Fretwell 1990	~	~	✓	✓	~	~
Subgroup 2.3.2 Progressive resistance exercise						
de Morton 2007	✓	✓	✓	✓	~	~
Mudge 2008	✗	✓	✓	✓	~	✗

Risk of bias for analysis 2.4 Hospital readmission

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Subgroup 2.4.1 Rehabilitation-related activities						
Asplund 2000	✓	~	✓	✓	~	~
Counsell 2000	✓	~	✓	✓	~	~
Ekerstad 2017	✗	✓	✓	✓	✓	✗

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	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Landefeld 1995	~	✓	✓	✓	~	~
Sahota 2017	~	✓	✓	✓	~	~
Slaets 1997	~	✓	✓	✓	~	~
Subgroup 2.4.2 Structured exercise						
Gazineo 2021	✓	✓	✓	✓	~	~
Subgroup 2.4.3 Progressive resistance exercise						
Courtney 2009	✓	✓	✓	✓	~	~
de Morton 2007	✓	✓	✓	✓	~	~
Martinez-Velilla 2019	✓	✓	✓	✓	✓	✓
McCullagh 2020	✓	✓	✓	✓	✓	✓
Mudge 2008	✗	✓	✓	✓	~	✗
Ortiz-Alonso 2020	✗	✓	✓	✓	✓	✗
Pedersen 2019	✓	✓	✓	✓	✓	✓

Risk of bias for analysis 2.5 Walking performance at discharge from hospital

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Subgroup 2.5.1 Rehabilitation-related activities						
Ekerstad 2017	✗	✓	✗	✗	✓	✗
Subgroup 2.5.2 Structured exercise						

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	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Hu 2020	✓	✓	✗	✓	~	✗
Killey 2006	✗	✗	~	✗	~	✗
Subgroup 2.5.3 Progressive resistance exercise						
de Morton 2007	✓	✓	✗	✗	~	✗
Jones 2006	✓	✓	✗	✓	~	✗
Pedersen 2019	✓	✓	✗	✓	✓	✗

DATA AND ANALYSES

Comparison 1. Major outcomes

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.1 Functional ability: independence with activities of daily living at discharge from hospital	16	5174	Std. Mean Difference (IV, Random, 95% CI)	0.09 [-0.02, 0.19]
1.1.1 Rehabilitation-related activities	4	2838	Std. Mean Difference (IV, Random, 95% CI)	0.00 [-0.12, 0.13]
1.1.2 Structured exercise	5	648	Std. Mean Difference (IV, Random, 95% CI)	0.12 [-0.21, 0.45]
1.1.3 Progressive resistance exercise	7	1688	Std. Mean Difference (IV, Random, 95% CI)	0.14 [-0.05, 0.32]
1.2 Functional ability: functional mobility at discharge from hospital	8	2369	Mean Difference (IV, Random, 95% CI)	0.54 [0.09, 0.99]
1.2.1 Rehabilitation-related activities	1	975	Mean Difference (IV, Random, 95% CI)	0.60 [0.06, 1.14]
1.2.2 Structured exercise	2	416	Mean Difference (IV, Random, 95% CI)	0.30 [-0.96, 1.57]
1.2.3 Progressive resistance exercise	5	978	Mean Difference (IV, Random, 95% CI)	0.63 [-0.28, 1.55]

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Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.3 Functional ability: new incidence of delirium during hospitalisation	7	2088	Risk Ratio (M-H, Random, 95% CI)	0.90 [0.58, 1.41]
1.3.1 Rehabilitation-related activities	2	732	Risk Ratio (M-H, Random, 95% CI)	0.86 [0.30, 2.50]
1.3.2 Structured exercise	1	100	Risk Ratio (M-H, Random, 95% CI)	3.00 [0.13, 71.92]
1.3.3 Progressive resistance exercise	4	1256	Risk Ratio (M-H, Random, 95% CI)	0.96 [0.55, 1.68]
1.4 Quality of life at discharge from hospital	4	875	Mean Difference (IV, Random, 95% CI)	6.04 [0.90, 11.18]
1.4.1 Rehabilitation-related activities	1	350	Mean Difference (IV, Random, 95% CI)	2.20 [-1.90, 6.30]
1.4.2 Structured exercise	1	76	Mean Difference (IV, Random, 95% CI)	3.74 [-6.32, 13.80]
1.4.3 Progressive resistance exercise	2	449	Mean Difference (IV, Random, 95% CI)	8.90 [2.35, 15.45]
1.5 Falls during hospitalisation	9	1787	Risk Ratio (IV, Random, 95% CI)	0.99 [0.59, 1.65]
1.5.1 Rehabilitation-related activities	1	250	Risk Ratio (IV, Random, 95% CI)	1.33 [0.30, 5.84]
1.5.2 Structured exercise	3	542	Risk Ratio (IV, Random, 95% CI)	0.76 [0.23, 2.53]
1.5.3 Progressive resistance exercise	5	995	Risk Ratio (IV, Random, 95% CI)	0.96 [0.48, 1.91]
1.6 Medical deterioration during hospitalisation	11	2730	Risk Ratio (M-H, Random, 95% CI)	1.02 [0.62, 1.68]
1.6.1 Rehabilitation-related activities	2	732	Risk Ratio (M-H, Random, 95% CI)	0.86 [0.30, 2.50]
1.6.2 Structured exercise	2	200	Risk Ratio (M-H, Random, 95% CI)	2.56 [0.48, 13.54]
1.6.3 Progressive resistance exercise	7	1798	Risk Ratio (M-H, Random, 95% CI)	0.99 [0.52, 1.87]

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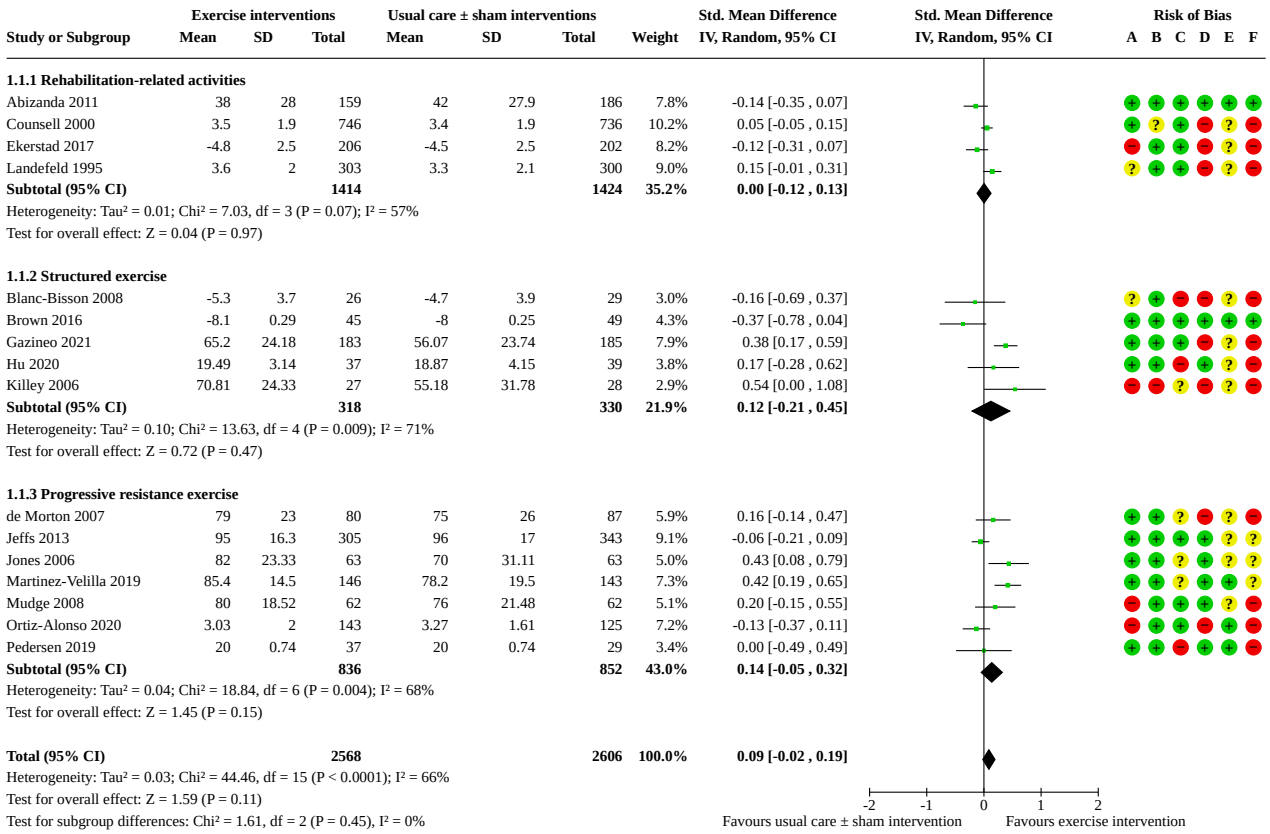
Analysis 1.1. Comparison 1: Major outcomes, Outcome 1: Functional ability: independence with activities of daily living at discharge from hospital



Risk of bias legend

(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

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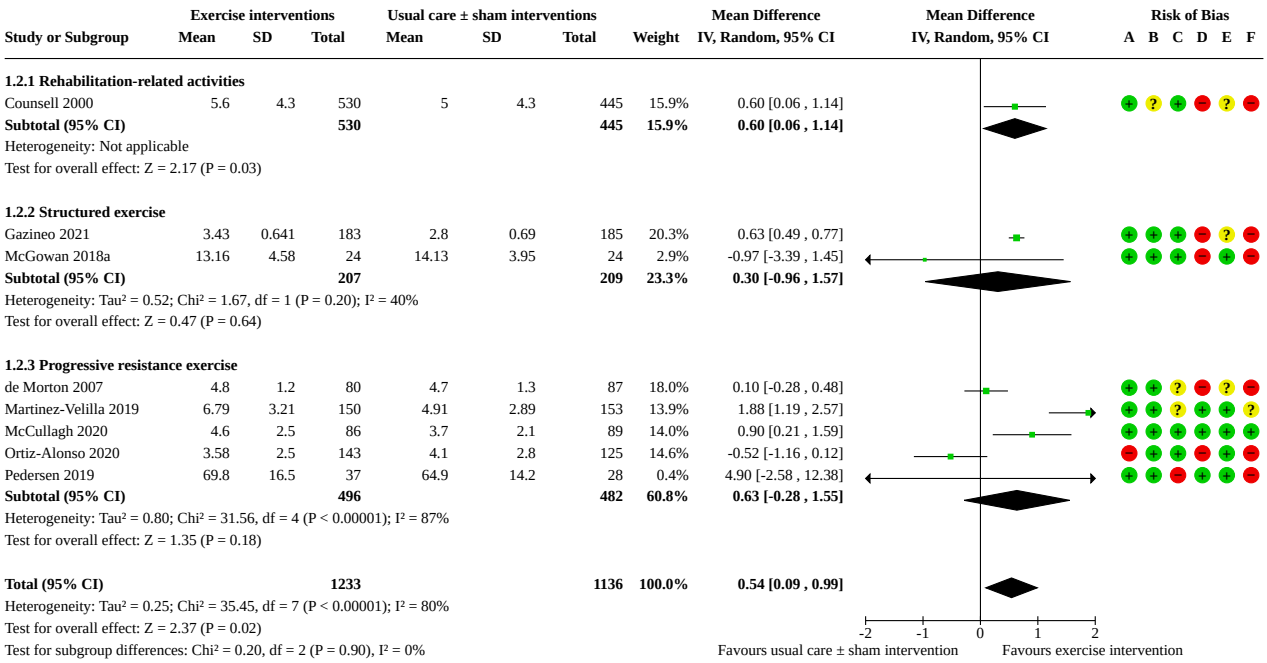
Analysis 1.2. Comparison 1: Major outcomes, Outcome 2: Functional ability: functional mobility at discharge from hospital



Risk of bias legend

(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

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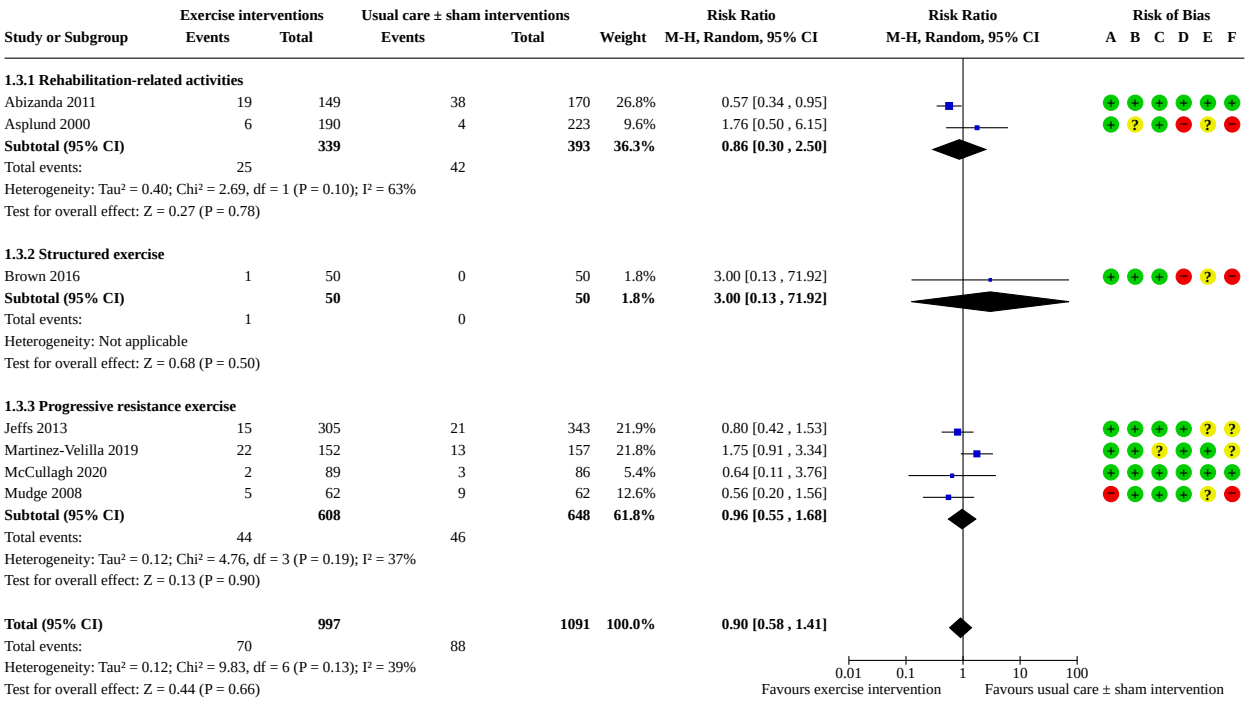
Analysis 1.3. Comparison 1: Major outcomes, Outcome 3: Functional ability: new incidence of delirium during hospitalisation



Risk of bias legend

(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

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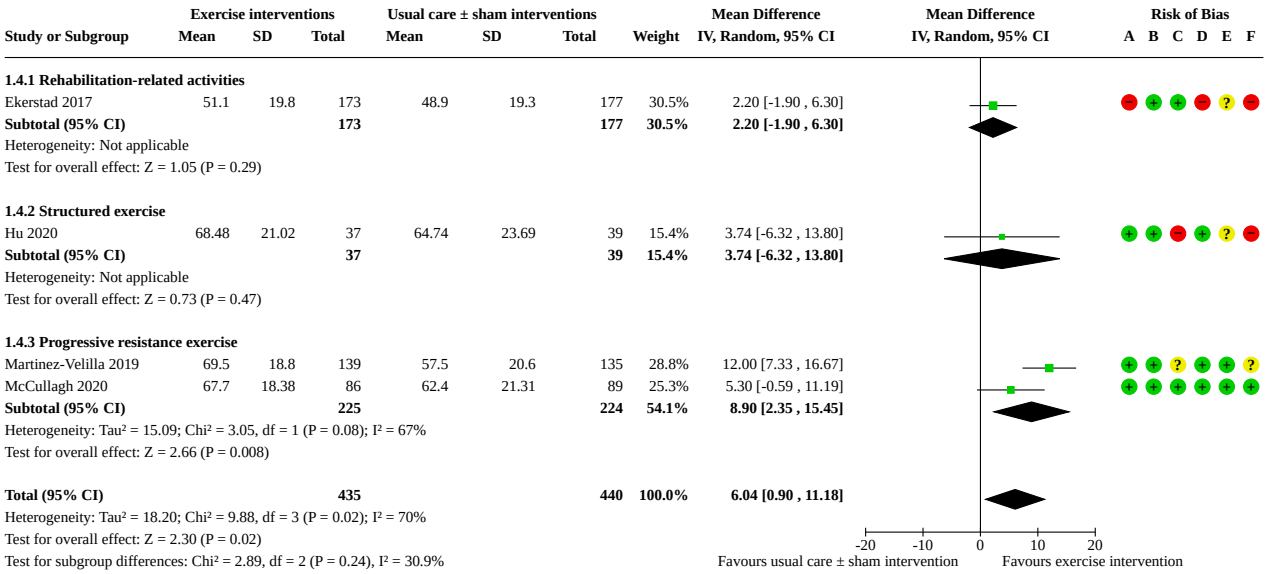
Analysis 1.4. Comparison 1: Major outcomes, Outcome 4: Quality of life at discharge from hospital



Risk of bias legend

(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

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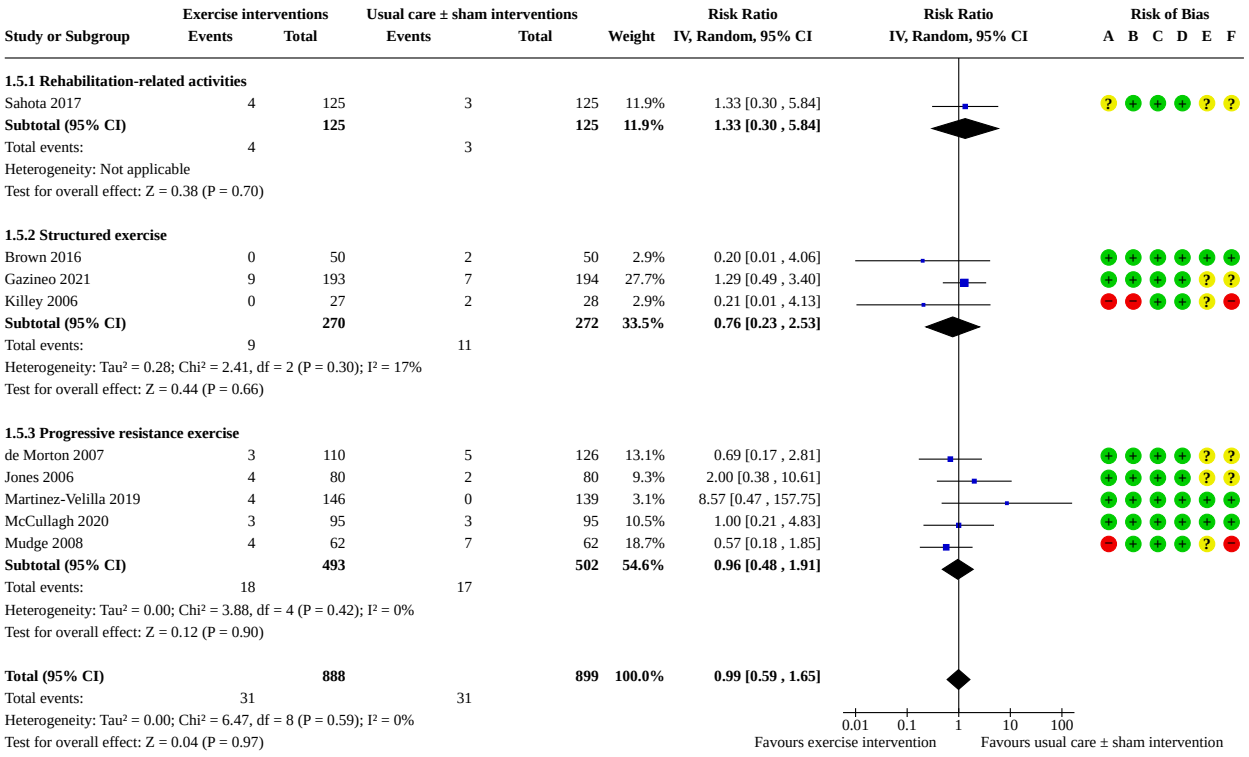
Analysis 1.5. Comparison 1: Major outcomes, Outcome 5: Falls during hospitalisation



Study or Subgroup	Exercise interventions Events	Total	Usual care ± sham interventions Events	Total	Weight	Risk Ratio IV, Random, 95% CI	Risk of Bias A B C D E F
1.5.1 Rehabilitation-related activities							
Sahota 2017	4	125	3	125	11.9%	1.33 [0.30 , 5.84]	? + + + ? ?
Subtotal (95% CI)		**125**		**125**	**11.9%**	**1.33 [0.30 , 5.84]**	
Total events:	4		3				
Heterogeneity: Not applicable							
Test for overall effect: Z = 0.38 (P = 0.70)							
1.5.2 Structured exercise							
Brown 2016	0	50	2	50	2.9%	0.20 [0.01 , 4.06]	+ + + + + +
Gazineo 2021	9	193	7	194	27.7%	1.29 [0.49 , 3.40]	+ + + + ? ?
Killey 2006	0	27	2	28	2.9%	0.21 [0.01 , 4.13]	− − + + ? −
Subtotal (95% CI)		**270**		**272**	**33.5%**	**0.76 [0.23 , 2.53]**	
Total events:	9		11				
Heterogeneity: Tau² = 0.28; Chi² = 2.41, df = 2 (P = 0.30); I² = 17%							
Test for overall effect: Z = 0.44 (P = 0.66)							
1.5.3 Progressive resistance exercise							
de Morton 2007	3	110	5	126	13.1%	0.69 [0.17 , 2.81]	+ + + + ? ?
Jones 2006	4	80	2	80	9.3%	2.00 [0.38 , 10.61]	+ + + + ? ?
Martinez-Velilla 2019	4	146	0	139	3.1%	8.57 [0.47 , 157.75]	+ + + + + +
McCullagh 2020	3	95	3	95	10.5%	1.00 [0.21 , 4.83]	+ + + + + +
Mudge 2008	4	62	7	62	18.7%	0.57 [0.18 , 1.85]	− + + + ? −
Subtotal (95% CI)		**493**		**502**	**54.6%**	**0.96 [0.48 , 1.91]**	
Total events:	18		17				
Heterogeneity: Tau² = 0.00; Chi² = 3.88, df = 4 (P = 0.42); I² = 0%							
Test for overall effect: Z = 0.12 (P = 0.90)							
Total (95% CI)		**888**		**899**	**100.0%**	**0.99 [0.59 , 1.65]**	
Total events:	31		31				
Heterogeneity: Tau² = 0.00; Chi² = 6.47, df = 8 (P = 0.59); I² = 0%							
Test for overall effect: Z = 0.04 (P = 0.97)							
Test for subgroup differences: Chi² = 0.33, df = 2 (P = 0.85), I² = 0%							

Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

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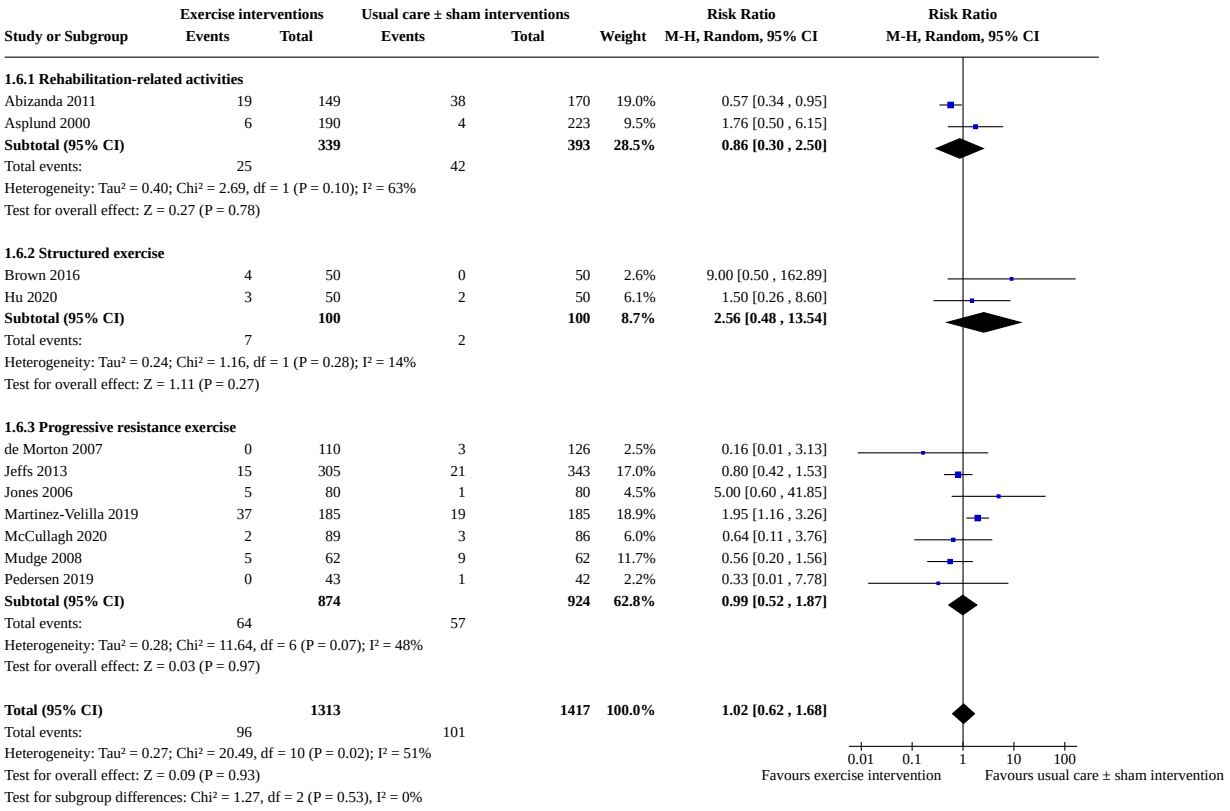
Analysis 1.6. Comparison 1: Major outcomes, Outcome 6: Medical deterioration during hospitalisation



Comparison 2. Minor outcomes

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2.1 Death during hospitalisation	20	6822	Risk Ratio (M-H, Random, 95% CI)	0.98 [0.79, 1.22]
2.1.1 Rehabilitation-related activities	7	3926	Risk Ratio (M-H, Random, 95% CI)	1.03 [0.78, 1.34]
2.1.2 Structured exercise	5	740	Risk Ratio (M-H, Random, 95% CI)	0.92 [0.54, 1.56]
2.1.3 Progressive resistance exercise	8	2156	Risk Ratio (M-H, Random, 95% CI)	0.89 [0.54, 1.48]
2.2 Hospital length of stay (days)	22	7182	Mean Difference (IV, Random, 95% CI)	-0.25 [-0.62, 0.12]
2.2.1 Rehabilitation-related activities	9	4388	Mean Difference (IV, Random, 95% CI)	-0.55 [-1.42, 0.32]
2.2.2 Structured exercise	4	635	Mean Difference (IV, Random, 95% CI)	-0.02 [-0.93, 0.89]

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Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2.2.3 Progressive resistance exercise	9	2159	Mean Difference (IV, Random, 95% CI)	-0.24 [-0.63, 0.16]
2.3 New institutionalisation at hospital discharge	5	2364	Risk Ratio (M-H, Random, 95% CI)	0.91 [0.74, 1.12]
2.3.1 Rehabilitation-related activities	3	2004	Risk Ratio (M-H, Random, 95% CI)	0.92 [0.74, 1.13]
2.3.2 Progressive resistance exercise	2	360	Risk Ratio (M-H, Random, 95% CI)	0.86 [0.37, 2.01]
2.4 Hospital readmission	14	4689	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.81, 1.11]
2.4.1 Rehabilitation-related activities	6	2960	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.78, 1.16]
2.4.2 Structured exercise	1	339	Risk Ratio (M-H, Random, 95% CI)	0.78 [0.52, 1.18]
2.4.3 Progressive resistance exercise	7	1390	Risk Ratio (M-H, Random, 95% CI)	0.99 [0.72, 1.36]
2.5 Walking performance at discharge from hospital	6	682	Std. Mean Difference (IV, Random, 95% CI)	-0.13 [-0.35, 0.09]
2.5.1 Rehabilitation-related activities	1	273	Std. Mean Difference (IV, Random, 95% CI)	-0.29 [-0.53, -0.05]
2.5.2 Structured exercise	2	131	Std. Mean Difference (IV, Random, 95% CI)	-0.32 [-0.80, 0.16]
2.5.3 Progressive resistance exercise	3	278	Std. Mean Difference (IV, Random, 95% CI)	0.09 [-0.15, 0.33]

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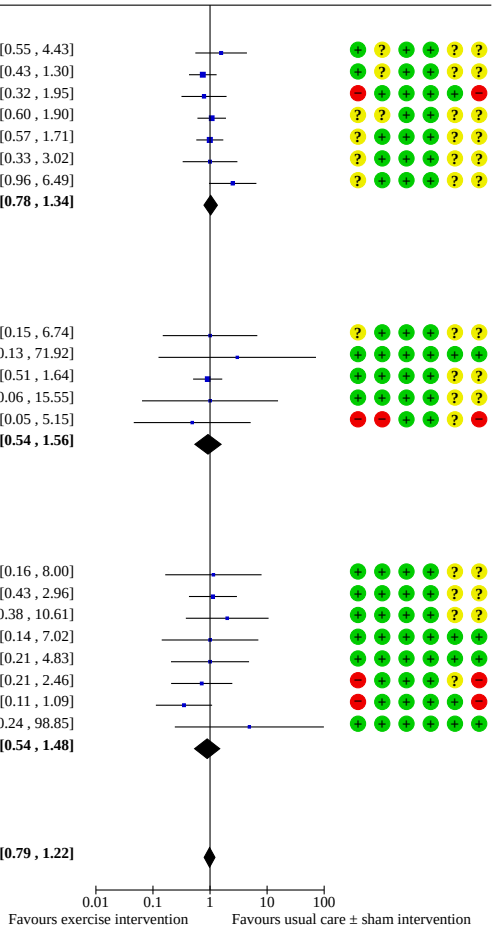
Analysis 2.1. Comparison 2: Minor outcomes, Outcome 1: Death during hospitalisation

Study or Subgroup	Exercise interventions Events	Total	Usual care ± sham interventions Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
2.1.1 Rehabilitation-related activities						
Asplund 2000	8	190	6	223	4.4%	1.56 [0.55 , 4.43]
Counsell 2000	21	767	28	764	15.3%	0.75 [0.43 , 1.30]
Ekerstad 2017	8	206	10	202	5.7%	0.78 [0.32 , 1.95]
Fretwell 1990	22	221	20	215	14.3%	1.07 [0.60 , 1.90]
Landefeld 1995	24	327	24	324	15.9%	0.99 [0.57 , 1.71]
Sahota 2017	6	125	6	125	3.9%	1.00 [0.33 , 3.02]
Slaets 1997	18	140	5	97	5.2%	2.49 [0.96 , 6.49]
Subtotal (95% CI)		**1976**		**1950**	**64.6%**	**1.03 [0.78 , 1.34]**
Total events:	107		99			
Heterogeneity: Tau² = 0.00; Chi² = 5.57, df = 6 (P = 0.47); I² = 0%						
Test for overall effect: Z = 0.19 (P = 0.85)						
2.1.2 Structured exercise						
Blanc-Bisson 2008	2	38	2	38	1.3%	1.00 [0.15 , 6.74]
Brown 2016	1	50	0	50	0.5%	3.00 [0.13 , 71.92]
Gazineo 2021	19	193	21	194	13.7%	0.91 [0.51 , 1.64]
Hu 2020	1	50	1	50	0.6%	1.00 [0.06 , 15.55]
Killey 2006	1	39	2	38	0.9%	0.49 [0.05 , 5.15]
Subtotal (95% CI)		**370**		**370**	**16.9%**	**0.92 [0.54 , 1.56]**
Total events:	24		26			
Heterogeneity: Tau² = 0.00; Chi² = 0.82, df = 4 (P = 0.94); I² = 0%						
Test for overall effect: Z = 0.31 (P = 0.76)						
2.1.3 Progressive resistance exercise						
de Morton 2007	2	110	2	126	1.3%	1.15 [0.16 , 8.00]
Jeffs 2013	8	305	8	343	5.0%	1.12 [0.43 , 2.96]
Jones 2006	4	80	2	80	1.7%	2.00 [0.38 , 10.61]
Martinez-Velilla 2019	2	185	2	185	1.2%	1.00 [0.14 , 7.02]
McCullagh 2020	3	95	3	95	1.9%	1.00 [0.21 , 4.83]
Mudge 2008	4	96	6	103	3.1%	0.72 [0.21 , 2.46]
Ortiz-Alonso 2020	4	143	10	125	3.7%	0.35 [0.11 , 1.09]
Pedersen 2019	2	43	0	42	0.5%	4.89 [0.24 , 98.85]
Subtotal (95% CI)		**1057**		**1099**	**18.5%**	**0.89 [0.54 , 1.48]**
Total events:	29		33			
Heterogeneity: Tau² = 0.00; Chi² = 5.19, df = 7 (P = 0.64); I² = 0%						
Test for overall effect: Z = 0.45 (P = 0.65)						
Total (95% CI)		**3403**		**3419**	**100.0%**	**0.98 [0.79 , 1.22]**
Total events:	160		158			
Heterogeneity: Tau² = 0.00; Chi² = 11.88, df = 19 (P = 0.89); I² = 0%						
Test for overall effect: Z = 0.17 (P = 0.87)						
Test for subgroup differences: Chi² = 0.30, df = 2 (P = 0.86), I² = 0%						



Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

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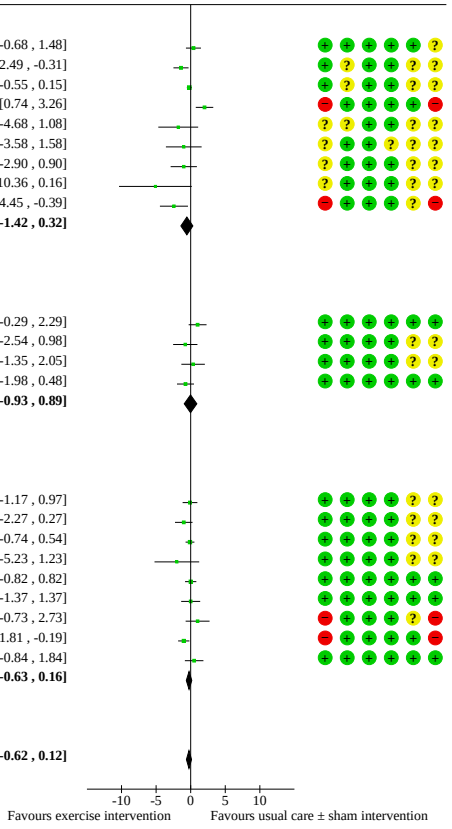
Analysis 2.2. Comparison 2: Minor outcomes, Outcome 2: Hospital length of stay (days)

Study or Subgroup	Exercise interventions Mean [days]	SD [days]	Total	Usual care ± sham interventions Mean [days]	SD [days]	Total	Weight	Mean Difference IV, Random, 95% CI [days]
2.2.1 Rehabilitation-related activities								
Abizanda 2011	9.3	5.3	159	8.9	4.9	186	5.8%	0.40 [-0.68 , 1.48]
Asplund 2000	5.9	5.6	190	7.3	5.7	223	5.7%	-1.40 [-2.49 , -0.31]
Counsell 2000	6.1	3.5	767	6.3	3.5	764	10.4%	-0.20 [-0.55 , 0.15]
Ekerstad 2017	11.2	6.1	206	9.2	6.9	202	4.9%	2.00 [0.74 , 3.26]
Fretwell 1990	12.9	12.9	221	14.7	17.4	215	1.4%	-1.80 [-4.68 , 1.08]
Landefeld 1995	7.3	16.8	327	8.3	16.8	324	1.7%	-1.00 [-3.58 , 1.58]
Sahota 2017	8	6.67	112	9	7.78	112	2.9%	-1.00 [-2.90 , 0.90]
Slaets 1997	19.7	14.2	140	24.8	23.63	97	0.5%	-5.10 [-10.36 , 0.16]
Zelada 2009	7.5	4.3	68	9.92	7.74	75	2.6%	-2.42 [-4.45 , -0.39]
Subtotal (95% CI)			**2190**			**2198**	**36.0%**	**-0.55 [-1.42 , 0.32]**
Heterogeneity: Tau² = 0.97; Chi² = 27.57, df = 8 (P = 0.0006); I² = 71%								
Test for overall effect: Z = 1.25 (P = 0.21)								
2.2.2 Structured exercise								
Brown 2016	4.6	4	50	3.6	2.4	50	4.8%	1.00 [-0.29 , 2.29]
Gazineo 2021	9.57	6.82	193	10.35	10.44	194	3.2%	-0.78 [-2.54 , 0.98]
Hu 2020	7.27	4.57	50	6.92	4.08	50	3.4%	0.35 [-1.35 , 2.05]
McGowan 2018a	4.63	2.16	24	5.38	2.18	24	5.1%	-0.75 [-1.98 , 0.48]
Subtotal (95% CI)			**317**			**318**	**16.4%**	**-0.02 [-0.93 , 0.89]**
Heterogeneity: Tau² = 0.31; Chi² = 4.65, df = 3 (P = 0.20); I² = 35%								
Test for overall effect: Z = 0.05 (P = 0.96)								
2.2.3 Progressive resistance exercise								
Courtney 2009	4.6	2.7	58	4.7	3.3	64	5.9%	-0.10 [-1.17 , 0.97]
de Morton 2007	5	5	108	6	4.8	124	4.9%	-1.00 [-2.27 , 0.27]
Jeffs 2013	5.5	3.9	293	5.6	4.2	328	8.6%	-0.10 [-0.74 , 0.54]
Jones 2006	9	8.9	71	11	11.1	77	1.2%	-2.00 [-5.23 , 1.23]
Martinez-Velilla 2019	8	4	185	8	4	185	7.4%	0.00 [-0.82 , 0.82]
McCullagh 2020	8	4.4	95	8	5.2	94	4.4%	0.00 [-1.37 , 1.37]
Mudge 2008	10	4.6	62	9	5.2	62	3.3%	1.00 [-0.73 , 2.73]
Ortiz-Alonso 2020	6	3	143	7	3.7	125	7.4%	-1.00 [-1.81 , -0.19]
Pedersen 2019	4.5	3.3	43	4	3	42	4.6%	0.50 [-0.84 , 1.84]
Subtotal (95% CI)			**1058**			**1101**	**47.6%**	**-0.24 [-0.63 , 0.16]**
Heterogeneity: Tau² = 0.06; Chi² = 9.72, df = 8 (P = 0.28); I² = 18%								
Test for overall effect: Z = 1.17 (P = 0.24)								
Total (95% CI)			**3565**			**3617**	**100.0%**	**-0.25 [-0.62 , 0.12]**
Heterogeneity: Tau² = 0.31; Chi² = 42.27, df = 21 (P = 0.004); I² = 50%								
Test for overall effect: Z = 1.31 (P = 0.19)								
Test for subgroup differences: Chi² = 0.71, df = 2 (P = 0.70), I² = 0%								



Risk of bias legend

(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

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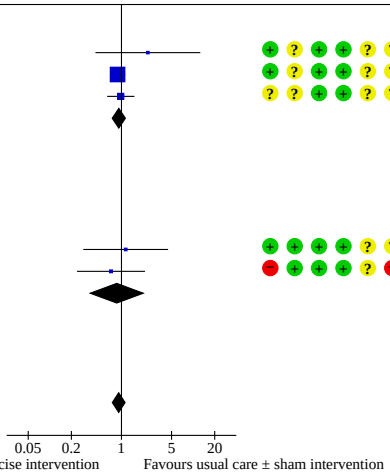
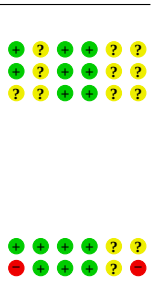
Analysis 2.3. Comparison 2: Minor outcomes, Outcome 3: New institutionalisation at hospital discharge

Study or Subgroup	Exercise interventions Events	Total	Usual care ± sham interventions Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
2.3.1 Rehabilitation-related activities						
Asplund 2000	4	160	2	187	1.5%	2.34 [0.43 , 12.59]
Counsell 2000	99	660	119	700	70.7%	0.88 [0.69 , 1.13]
Fretwell 1990	30	143	33	154	21.9%	0.98 [0.63 , 1.52]
Subtotal (95% CI)		**963**		**1041**	**94.2%**	**0.92 [0.74 , 1.13]**
Total events:	133		154			
Heterogeneity: Tau² = 0.00; Chi² = 1.37, df = 2 (P = 0.50); I² = 0%						
Test for overall effect: Z = 0.79 (P = 0.43)						
2.3.2 Progressive resistance exercise						
de Morton 2007	4	110	4	126	2.3%	1.15 [0.29 , 4.47]
Mudge 2008	5	62	7	62	3.5%	0.71 [0.24 , 2.13]
Subtotal (95% CI)		**172**		**188**	**5.8%**	**0.86 [0.37 , 2.01]**
Total events:	9		11			
Heterogeneity: Tau² = 0.00; Chi² = 0.28, df = 1 (P = 0.60); I² = 0%						
Test for overall effect: Z = 0.35 (P = 0.73)						
Total (95% CI)		**1135**		**1229**	**100.0%**	**0.91 [0.74 , 1.12]**
Total events:	142		165			
Heterogeneity: Tau² = 0.00; Chi² = 1.67, df = 4 (P = 0.80); I² = 0%						
Test for overall effect: Z = 0.85 (P = 0.39)						
Test for subgroup differences: Chi² = 0.02, df = 1 (P = 0.88), I² = 0%						





Risk of bias legend

(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
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(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

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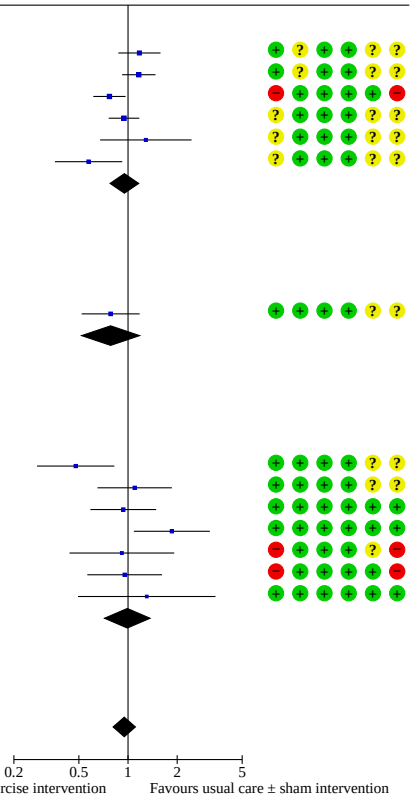
Analysis 2.4. Comparison 2: Minor outcomes, Outcome 4: Hospital readmission

Study or Subgroup	Exercise interventions Events	Total	Usual care ± sham interventions Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
2.4.1 Rehabilitation-related activities						
Asplund 2000	61	190	61	223	10.2%	1.17 [0.87 , 1.58]
Counsell 2000	122	580	103	570	11.8%	1.16 [0.92 , 1.47]
Ekerstad 2017	73	179	88	166	12.0%	0.77 [0.61 , 0.97]
Landefeld 1995	104	303	109	300	12.3%	0.94 [0.76 , 1.17]
Sahota 2017	18	106	14	106	4.3%	1.29 [0.67 , 2.45]
Slaets 1997	24	140	29	97	6.5%	0.57 [0.36 , 0.92]
Subtotal (95% CI)		**1498**		**1462**	**57.2%**	**0.95 [0.78 , 1.16]**
Total events:	402		404			
Heterogeneity: Tau² = 0.04; Chi² = 13.41, df = 5 (P = 0.02); I² = 63%						
Test for overall effect: Z = 0.50 (P = 0.62)						
2.4.2 Structured exercise						
Gazineo 2021	33	174	40	165	7.7%	0.78 [0.52 , 1.18]
Subtotal (95% CI)		**174**		**165**	**7.7%**	**0.78 [0.52 , 1.18]**
Total events:	33		40			
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.18 (P = 0.24)						
2.4.3 Progressive resistance exercise						
Courtney 2009	13	58	30	64	5.5%	0.48 [0.28 , 0.82]
de Morton 2007	22	108	23	124	5.8%	1.10 [0.65 , 1.86]
Martinez-Velilla 2019	29	185	31	185	6.7%	0.94 [0.59 , 1.49]
McCullagh 2020	30	95	16	94	5.6%	1.86 [1.09 , 3.17]
Mudge 2008	11	62	12	62	3.5%	0.92 [0.44 , 1.92]
Ortiz-Alonso 2020	24	143	22	125	5.7%	0.95 [0.56 , 1.61]
Pedersen 2019	8	43	6	42	2.3%	1.30 [0.49 , 3.43]
Subtotal (95% CI)		**694**		**696**	**35.1%**	**0.99 [0.72 , 1.36]**
Total events:	137		140			
Heterogeneity: Tau² = 0.10; Chi² = 12.70, df = 6 (P = 0.05); I² = 53%						
Test for overall effect: Z = 0.06 (P = 0.95)						
Total (95% CI)		**2366**		**2323**	**100.0%**	**0.95 [0.81 , 1.11]**
Total events:	572		584			
Heterogeneity: Tau² = 0.04; Chi² = 27.07, df = 13 (P = 0.01); I² = 52%						
Test for overall effect: Z = 0.66 (P = 0.51)						
Test for subgroup differences: Chi² = 0.87, df = 2 (P = 0.65), I² = 0%						



Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
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(F) Overall bias

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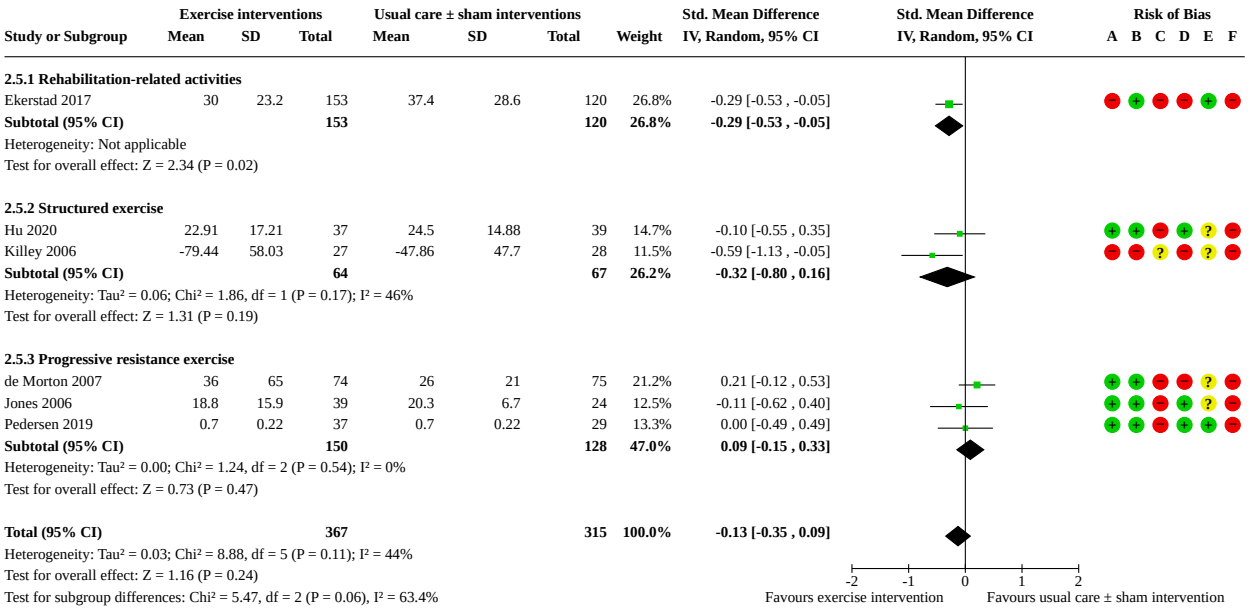
Analysis 2.5. Comparison 2: Minor outcomes, Outcome 5: Walking performance at discharge from hospital



Risk of bias legend

(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

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ADDITIONAL TABLES

Table 1. Descriptions of usual care, control interventions and exercise interventions

Study ID	Usual care setting and description	Control/sham intervention	Intervention group setting and description	Intervention subgroup category	Exercise component of intervention	Exercise dose prescription	Exercise intervention adherence
Abizanda 2011	Acute geriatric unit. Geriatrician-led care, physiotherapy requested by the geriatrician as required.	None.	Usual care conditions with additional occupational therapy interventions.	Rehabilitation-related activities.	Occupational therapy including practice of activities of daily living.	45 minutes, 5 times per week (Monday–Friday), for the duration of hospital admission.	Mean 5 sessions per participant.
Asplund 2000	Medical ward. Internist-led care, physiotherapy and occupational therapy not routinely available. No geriatrician.	None.	Acute geriatric ward. Care provided by both geriatricians and internists. Multidisciplinary team included physiotherapists, occupational therapists and dietitians. Emphasis on interdisciplinary care.	Rehabilitation-related activities.	Exercise component not specifically described, intervention included early start of rehabilitation and routine physiotherapy and occupational therapy assessments.	No information.	No information.
Blanc-Bisson 2008	Acute care geriatric medicine unit. Physiotherapy provided from day 3 of admission, for 3 sessions per week until discharge.	None.	Usual care conditions with additional physiotherapy.	Structured exercise.	Early physiotherapy starting from day 1–2 of admission consisting of bed and standing exercises.	30 minutes, 2 times per day, 5 times per week, until deemed clinically stable.	No information.
Brown 2016	Medical ward. Physicians could order physiotherapy services.	Usual care with daily 15- to 20-minute visits from research assistants, up to twice daily, 7 days per week. Participants requested to keep a diary	Usual care conditions + mobility programme, and encouragement to increase time out of bed.	Structured exercise	Assisted/ supervised mobility programme with behavioural intervention to encourage additional physical activity outside the supervised intervention.	15–20 minutes, up to twice per day, 7 days per week, for the duration of hospital admission.	122/238 (51.3%) potential walks were completed.

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Table 1. Descriptions of usual care, control interventions and exercise interventions *(Continued)*

		of their visitors.					
Counsell 2000	Usual care units. Not described.	None.	Acute Care for Elders Unit Renovated ward with a physiotherapy room. Daily interdisciplinary team rounds provided by geriatrician medical director and geriatric clinical nurse specialist who created care plans. Care processes designed to promote functional independence.	Rehabilitation related activities.	Exercise component not specifically described, intervention included a mobility protocol and physiotherapy.	No information.	No information.
Courtney 2009	Medical ward. Routine care, discharge planning and rehabilitation advice normally provided.	None.	Usual care with additional exercise.	Progressive resistance exercise.	With 72 hours of admission a care plan was produced by a nurse and physiotherapist which included: facilitated stretching, balance training, walking and strengthening exercises.	Walking for up to 15 minutes (duration of other exercise not specified), up to 2–4 times per week, for the duration of the hospital admission.	No information regarding in-hospital adherence.
de Morton 2007	Medical wards. Daily medical assessment, and allied health service on referral.	None.	Usual care with additional exercise.	Progressive resistance exercise.	Supervised strengthening and mobility exercise.	20–30 minutes, twice per day, 5 days per week, for the duration of the hospital admission.	No information.
Ekerstad 2017	Acute medical care unit. Care led by physicians specialising in internal medicine. Physiotherapy/ occupational therapy available for counselling only.	None.	Comprehensive geriatric assessment unit. Structured comprehensive geriatric assessment and care led by physicians specialising in internal medicine, family medicine, geriatrics or a combination. Unit staff included physio-	Rehabilitation-related activities.	Exercise component not specifically described, intervention included routine physiotherapy and occupational therapy.	No information.	No information.

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Table 1. Descriptions of usual care, control interventions and exercise interventions *(Continued)*

			therapists and occupational therapists.				
Fretwell 1990	Medical or surgical floors. Description not provided other than 'standard medical care'.	None.	Senior Care Unit Functional assessment on admission, 3 clinical team meetings and 1 administration meeting weekly. Geriatric assessment team included nurse co-ordinators and a physiotherapist. Emphasise interdisciplinary comprehensive geriatric assessment and intervention.	Rehabilitation-related activities.	Exercise component not specifically described, intervention included routine functional assessment and physiotherapy.	No information.	No information.
Gazineo 2021	Geriatric unit. Care led by a geriatrician and provided by multidisciplinary team.	None.	Usual care with a walking intervention guided by geriatrician, delivered by nurses.	Structured exercise.	Assisted walking programme.	20–30 minutes, daily, 5 days per week, for the duration of hospitalisation.	A mean time of 32 minutes per session (range 10–67), with a mean distance of 89 m (range 0–260). Mean number of intervention days for each participant was 5.8.
Hu 2020	Medical wards. Not described.	None.	Usual care conditions with mobility programme.	Structured exercise.	Assisted or supervised exercise, including balance, pedalling and mobility activities.	Up to 30 minutes per day, for the duration of hospital admission.	No information.
Jeffs 2013	Medical unit. Daily medical assessment and allied health professionals available via referral.	None.	Usual care conditions with additional exercise and orientation.	Progressive resistance exercise.	Progressive resistance exercise and mobility training.	20–30 minutes per day (Monday–Friday), twice per day, for the duration of hospitalisation.	Median of 1.4 therapy sessions per day or 38 minutes per day (including weekends and routine therapy). This was equivalent to approximately 1.4 sessions or 42 minutes of additional therapy per weekday compared to the control group.

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Table 1. Descriptions of usual care, control interventions and exercise interventions *(Continued)*

Jones 2006	General medical wards. Allied health interventions including physiotherapy available.	None.	Usual care conditions with additional exercise.	Progressive resistance exercise.	Individualised assisted or supervised strength, balance and functional exercises.	30 minutes, twice per day for the duration of hospitalisation.	Median of 160 minutes (IQR 120–360) participating in the exercise intervention.
Killey 2006	Medical units. Physiotherapy available.	None.	Usual care conditions with additional assisted/ supervised walking.	Structured exercise.	Assisted or supervised walking programme.	Twice per day, 7 days per week, for 7 days. The distance walked was the maximum distance able to be comfortably walked as decided by that individual at that time.	No information.
Landefeld 1995	General medical unit. Care led by attending physician, nursing:participant ratio approximately 1:2. Access to hospital wide support services including physiotherapy.	None.	Acute Care for Elders Unit Care led by medical and nursing directors. Increased funded multidisciplinary team hours compared to usual care (including physiotherapy) with care protocols and ward environment designed to promote independence and early discharge.	Rehabilitation-related activities	Exercise component not specifically described, intervention included a mobility protocol and physiotherapy.	No information.	No information.
Martinez-Velilla 2019	Acute Care for the Elderly Unit. Care led by a geriatrician with routine physiotherapy available when needed.	None	Usual care conditions with additional exercise.	Progressive resistance exercise	Supervised morning sessions included progressive resistance, balance and walking exercises. Unsupervised functional exercises in evenings.	20 minutes, twice per day for 5–7 consecutive days (including weekends).	The mean number of completed morning sessions per participant was 5 (SD 1) and evening sessions was 4 (SD 1). Adherence to the intervention was 95.8% for the morning sessions (i.e. 806 successfully completed sessions

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Table 1. Descriptions of usual care, control interventions and exercise interventions *(Continued)*

							of 841 total possible sessions) and 83.4% in the evening sessions (574 of 688 successfully completed sessions).
McCullagh 2020	All wards admitting older medical patients. Physiotherapy available to all participants (mean 3 sessions per week).	Usual care with twice-daily sessions (Monday–Friday) each 20–30 minutes of stretching and relaxation exercises in lying or sitting. Participants encouraged to talk about their condition and exercise, none given education, encouragement or assisted to exercise or walk more.	Usual care with additional exercise.	Progressive resistance exercise.	Assisted or supervised tailored strengthening, balance and gait exercises.	Up to 30 minutes, 2 times per day (Monday–Friday) for the duration of hospital admission.	63/95 participants completed ≥ 75% of possible exercise sessions; 16/95 participants completed 50–74% of possible exercise sessions. 13/95 participants completed 25–49% of possible exercise sessions. 3/95 participants completed < 25% of possible exercise sessions.
McGowan 2018a	Acute medical wards for older people. Not described.	None.	Usual care with additional pedalling exercise.	Structured exercise.	Unsupervised pedalling exercise.	5 minutes, 3 times per day.	The median number of revolutions cycled throughout the entire study period with the pedal exerciser was 152 (IQR 43.5–464.5) revolutions. The median time spent on the pedal exerciser was 5.08 (IQR 2.03–20.05) minutes across the whole study period.

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Table 1. Descriptions of usual care, control interventions and exercise interventions *(Continued)*

Mudge 2008	Medical ward. Multidisciplinary care included daily discussion of participant progress and discharge plan. Referrals made to physiotherapy or occupational therapy when needed.	None.	Medical ward Usual care with additional exercise and cognitive group therapy to encourage mobility. Intervention ward staff, participants and carers educated to encourage mobility and functional independence.	Progressive resistance exercise.	Graduated and tailored supervised exercise programme.	Twice per day for the duration of hospital admission.	92% of participants in the intervention group received an exercise diary and made some record of exercise; 1/3 completed their diary every day.
Ortiz-Alonso 2020	Acute care of older patient units Not described.	None.	Usual care with additional exercise.	Progressive resistance exercise.	Supervised walking and sit to stand exercises.	1–3 sessions per day, with a total duration of approximately 20 minutes per day (Monday–Friday).	Participants performed a median of 3 training days (IQR 2) and 2 training sessions per day (IQR 2), with a mean total exercise time per day of 20 minutes (for each session, the median duration of the walking part was 5 minutes (IQR 4, range 0–10), and participants performed a mean of 9 (SD 6, range 0 to 30) sit-to-stands).
Pedersen 2019	Acute medical ward and internal medicine ward. National targets to assess function and nutrition and make an appropriate plan within 24–48 hours of admission. Rehabilitation often started during hospitalisation.	None.	Usual care with additional exercise and protein supplements.	Progressive resistance exercise.	Supervised progressive strength training based on sit to stand exercises.	20 minutes daily (Monday–Friday) for the duration of hospital admission.	78.8% of participants started the intervention 0–2 days after admission. Overall (during and after hospitalisation), 43% (18/42) of the participants randomised to the intervention group were very compliant with the intervention (80% of sessions performed

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Table 1. Descriptions of usual care, control interventions and exercise interventions *(Continued)*

							with 2 sets of 8 repetitions).
Sahota 2017	General medical elderly care wards. Therapy provided by ward occupational therapist and physiotherapist on weekdays only.	None.	General medical elderly care wards. Therapy provided by community therapy team including occupational therapist and physiotherapist 7 days per week if appropriate.	Rehabilitation related activities.	Exercise component not specifically described, intervention included daily rehabilitation with a physiotherapist or occupational therapist.	Daily, duration dependent on needs.	No information.
Slaets 1997	General medical unit. Description not provided.	None.	General Medical Unit. In addition to usual care, a geriatric team consisting of a geriatrician, physiotherapist and liaison nurse provided care including daily physiotherapy. The aim of the team was to optimise function and mobility.	Rehabilitation related activities	Exercise component not specifically described, intervention included daily physiotherapy.	No information.	No information.
Zelada 2009	Internal medical care unit. Care led by internist physician and had access to physical and occupational therapy by referral.	None.	Geriatric care unit. Care led by geriatrician and ward team included physiotherapist and occupational therapist.	Rehabilitation-related activities	Exercise component not specifically described, intervention included a mobility protocol and physiotherapy.	No information.	No information.

IQR: interquartile range; SD: standard deviation.

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APPENDICES

Appendix 1. CENTRAL search strategy

Search Term
1. (medical near/1 inpatient*)
2. hospitali*ed
3. (geriatric near/1 inpatient*)
4. acute near/1 geriatric
5. (admitted near/1 patients)
6. (medical near/5 unit)
7. MeSH descriptor: [Inpatients] explode all trees
8. MeSH descriptor: [Hospitalization] in all MeSH products
9. MeSH descriptor: [Hospitals] explode all trees
10. MeSH descriptor: [Hospital Units] explode all trees
11. #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10
12. old*
13. elder*
14. MeSH descriptor: [Aged] explode all trees
15. MeSH descriptor: [Aging] explode all trees
16. MeSH descriptor: [Geriatrics] explode all trees
17. #12 or #13 or #14 or #15 or #16
18. exercise* or exercising
19. (physical near/3 (education or training))
20. strength* near/3 train*
21. resist* near/3 train*
22. balance near/3 train*
23. kinesiotherap*
24. physiother*
25. physical near/1 therap*

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(Continued)

26. rehabilitat*
27. ambulat*
28. "individual care plans"
29. cycling or bicycling
30. cycle* or bicycl*
31. pedal*
32. walk*
33. weight near/1 train*
34. muscle near/1 strength*
35. vibration
36. pilates
37. exertion*
38. tai near/1 chi
39. ai near/1 chi
40. hydrotherap*
41. swim*
42. yoga
43. treadmill*
44. row or rows or rowing
45. jog*
46. MeSH descriptor: [Exercise] explode all trees
47. MeSH descriptor: [Physical Therapy Modalities] explode all trees
48. MeSH descriptor: [Physical Therapy Speciality] explode all trees
49. MeSH descriptor: [Rehabilitation] explode all trees
50. MeSH descriptor: [Physical Therapists] explode all trees
51. MeSH descriptor: [Physical Fitness] explode all trees
52. MeSH descriptor: [Physical Exertion] explode all trees
53. MeSH descriptor: [Physical Endurance] explode all trees

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(Continued)

54. MeSH descriptor: [Exercise Therapy] explode all trees
55. MeSH descriptor: [Walking] explode all trees
56. MeSH descriptor: [Vibration] explode all trees
57. MeSH descriptor: [Tai Ji] explode all trees
58. MeSH descriptor: [Dancing] explode all trees
59. MeSH descriptor: [Swimming] explode all trees
60. MeSH descriptor: [Yoga] explode all trees
61. MeSH descriptor: [Fitness Trackers] explode all trees
62. MeSH descriptor: [Sports] explode all trees
63. MeSH descriptor: [Running] explode all trees
64. MeSH descriptor: [Jogging] explode all trees
65. #18 or #19 #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44 or #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60 or #61 or #62 or #63 or #64
66. #11 and #17 and #65 in trials

Appendix 2. MEDLINE via Ovid search strategy

Search Term
1. Inpatients/
2. exp Hospitalization/
3. exp hospitals/
4. exp hospital units/
5. (medical inpatient*).mp.
6. hospitali*ed.mp.
7. (geriatric inpatient)*.mp.
8. (acute geriatric).mp.
9. (admitted adj1 patients).mp.
10. (medical adj5 unit).mp

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(Continued)

11. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10
12. exp aged/
13. exp aging/
14. Geriatrics/
15. old*.mp.
16. elder*.mp.
17. 12 or 13 or 14 or 15 or 16
18. exp exercise/
19. Physical Therapy Specialty/
20. exp Physical Therapy Modalities/
21. Physical Therapists/
22. exp Physical Fitness/
23. Physical Exertion/
24. exp Physical Endurance/
25. exp rehabilitation/
26. exp Exercise Therapy/
27. exp Walking/
28. exp Vibration/
29. Tai Ji/
30. Dancing/
31. Swimming/
32. Yoga/
33. Fitness Trackers/
34. exp sports/
35. Running/ or Jogging/
36. (exercise* or exercising).mp.
37. (physical adj3 (education or training)).mp.
38. (strength* adj3 train*).mp.

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(Continued)

39. (resist* adj3 train*).mp.
40. (balance adj3 train*).mp.
41. kinesiotherap*.mp.
42. physiother*.mp.
43. (physical therap*).mp.
44. rehabilitat*.mp.
45. ambulat*.mp.
46. (individual care plans).mp.
47. (cycling or bicycling).mp.
48. (cycle* or bicycl*).mp.
49. pedal*.mp.
50. walk*.mp.
51. weight train*.mp.
52. muscle strength*.mp.
53. vibration.mp
54. pilates.mp.
55. exertion*.mp.
56. tai chi.mp.
57. ai chi.mp.
58. hydrotherap*.mp.
59. swim*.mp.
60. yoga.mp.
61. treadmill*.mp.
62. (row or rows or rowing).mp.
63. jog*.mp.
64. 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63
65. randomized controlled trial.pt.

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(Continued)

66. controlled clinical trial.pt.
67. randomized.ab.
68. placebo.ab.
69. clinical trials as topic.sh.
70. randomly.ab.
71. trial.ti.
72. 31 or 32 or 33 or 34 or 35 or 36 or 37
73. exp animals/ not humans.sh.
74. 38 not 39
75. 9 and 15 and 30 and 40

Appendix 3. Embase via Ovid search strategy

Search Terms
1. exp hospital patient/
2. geriatric patient/
3. hospitalization/
4. exp hospital/
5. hospital admission/
6. (medical inpatient*).mp.
7. hospitali*ed.mp.
8. (geriatric inpatient*).mp.
9. (acute geriatric).mp.
10. (admitted adj1 patients).mp.
11. (medical adj5 unit).mp
12. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11
13. exp aged/
14. exp aging/

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(Continued)

15. exp geriatrics/
16. old*.mp.
17. elder*.mp.
18. 13 or 14 or 15 or 16 or 17
19. exp exercise/
20. exp kinesiotherapy/
21. exp physiotherapy
22. exp rehabilitation/
23. physiotherapist/
24. exp physical activity/
25. endurance/
26. exp walking/
27. exp sports/
28. fitness/
29. dancing/
30. Tai Chi/
31. activity trackers/
32. exp vibration/
33. swimming/
34. hydrotherapy/
35. yoga/
36. (exercise* or exercising).mp.
37. (physical adj3 (education or training)).mp.
38. (strength* adj3 train*).mp.
39. (resist* adj3 train*).mp.
40. (balance adj3 train*).mp.
41. kinesiotherap*.mp.
42. physiother*.mp.

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(Continued)

43. (physical therap*).mp.
44. rehabilitat*.mp.
45. ambulat*.mp.
46. (individual care plans).mp.
47. (cycling or bicycling).mp.
48. (cycle* or bicycl*).mp.
49. pedal*.mp.
50. walk*.mp.
51. weight train*.mp.
52. muscle strength*.mp.
53. vibration.mp.
54. pilates.mp.
55. exertion*.mp.
56. tai chi.mp.
57. ai chi.mp.
58. hydrotherap*.mp.
59. swim.mp.
60. yoga.mp.
61. (row or rows or rowing).mp.
62. treadmill*.mp.
63. jog*.mp.
64. 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63
65. random*.mp.
66. factorial*.mp.
67. crossover*.mp.
68. cross over*.mp.
69. placebo*.mp.

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(Continued)

70. (doubl* adj blind*).mp.
71. (singl* adj blind*).mp.
72. assign*.mp.
73. allocat*.mp.
74. volunteer*.mp.
75. crossover procedure/
76. double blind procedure/
77. randomized controlled trial/
78. single blind procedure/
79. 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45
80. 10 and 16 and 31 and 46

Appendix 4. ClinicalTrials.gov search strategy

Search terms
1. Other terms: Hospital
2. Intervention/treatment: Exercise
3. 1 and 2 (with applied filters: Completed, Interventional, Older Adult (65+)
4. First posted on or after 10/05/2018

Appendix 5. WHO trial registry search strategy

Search terms
In the title: hospital or inpatient
In the intervention: exercise or physiotherapy or walking or rehabilitation
Recruitment status: ALL
Limited to 10/05/2018

WHAT'S NEW

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Date	Event	Description
3 June 2021	New citation required and conclusions have changed	Updated review, last literature search: May 2021
3 June 2021	New search has been performed	Review updated, latest search carried out May 2021

HISTORY

Protocol first published: Issue 2, 2006
Review first published: Issue 1, 2007

Date	Event	Description
11 December 2018	New search has been performed	New search undertaken and review updated
17 September 2008	Amended	Converted to new review format. C034-R

CONTRIBUTIONS OF AUTHORS

PH performed the literature search; reviewed the search results for eligibility; identified all included trials; performed data extraction; assessed risk of bias of the included trials; conducted data analysis; drafted the updated protocol and the final review.

JK reviewed the search results for eligibility; identified all included trials; performed data extraction; assessed risk of bias of the included trials; provided judgements on the interpretation of the results and conclusions drawn; was involved in the writing and approval of the protocol and the final review.

KJ reviewed the search results for eligibility; identified all included trials; performed data extraction; assessed risk of bias of the included trials; provided judgements on the interpretation of the results and conclusions drawn; was involved in the writing and approval of the protocol and the final review.

MR reviewed the search results for eligibility; identified all included trials; performed data extraction; assessed risk of bias of the included trials; provided judgements on the interpretation of the results and conclusions drawn; was involved in the writing and approval of the protocol and the final review.

TS reviewed the search results for eligibility; identified all included trials; performed data extraction; assessed risk of bias of the included trials; provided judgements on the interpretation of the results and conclusions drawn; was involved in the writing and approval of the protocol and the final review.

DECLARATIONS OF INTEREST

PH: none.

JK: none.

KJ: none.

MR: none.

TS: none.

Two review authors (JK, KJ) conducted included studies. They were not involved in the screening, data extraction or risk of bias assessments of their studies.

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- No sources of support provided

External sources

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- Cambridge Biomedical Research Centre and The Addenbrooke's Charitable Trust research grant, UK

  Peter Hartley is funded by a fellowship from the Cambridge Biomedical Research Centre and The Addenbrooke's Charitable Trust [grant reference: 03/20 A] (March 2020 to Feb 2021)

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

We planned to report adverse events during hospitalisation as a combined outcome. As adverse events were expected to be defined differently by different studies, the plan was to include any and all of participant mortality, falls, medical deterioration and musculoskeletal injury as a combined adverse-event outcome. However, we changed this for three reasons.

- Combining the outcomes might have led to double counting of participants who experienced an adverse event (e.g. if the same participant experienced both a fall and medical deterioration).
- The estimate of baseline risk of experiencing an adverse event would have been very different depending on the number and type of adverse events reported by the different studies.
- Interpretation of the analysis for the combined outcome would be very challenging due to the very different natures of the individual outcomes.

Therefore, we decided not to combine the outcomes, but to analyse each separately.

We did not plan separate analyses for studies that compared exercise interventions to a sham-control intervention and those that did not, as per the reasons outlined in Types of interventions section. However, after discussions with the editors, we made a post-hoc decision to conduct subgroup analyses to examine the effect of sham interventions in addition to usual care for the outcomes: independence with activities of daily living at hospital discharge and functional mobility at hospital discharge. We compared exercise interventions to usual care (excluding studies using sham-control interventions) and separately compared exercise interventions to sham control interventions.

INDEX TERMS

Medical Subject Headings (MeSH)

Controlled Clinical Trials as Topic; *Exercise Therapy; Hospital Costs; *Length of Stay; *Physical Fitness; Randomized Controlled Trials as Topic

MeSH check words

Aged; Aged, 80 and over; Humans

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