



Effectiveness of Home-Based Physical Rehabilitation on Quality of Life in ICU Survivors: A Rapid Evidence Assessment

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Background: Survivors of serious illness such as patients with post-intensive care syndrome (PICS) often require extensive rehabilitation. PICS is a complex syndrome affecting many aspects of quality of life. Complications of PICS that are most debilitating according to self-reports of patients were fatigue, sleep disturbance, weakness, and joint pain (see Figure 1). Often patients are sent home to recover from PICS, but the efficacy of post-intensive care unit (post-ICU) physical therapy has not been well established.

Purpose: To determine whether home-based physical rehabilitation management improves quality of life for patients with post-ICU-acquired illness.

Methods: A rapid evidence assessment (REA) was undertaken using the Cochrane Database of Systematic Reviews, Medline, PubMed, and SportDiscus (see Table 1). Inclusion criteria were: randomized control trials with subjects diagnosed with chronic or critical illness, 18 years or older, discharged from the hospital after an ICU unit stay, and underwent a physical rehabilitation program that primarily took place at home after discharge. Exclusion criteria were: patients that were in the hospital due to a musculoskeletal injury, were already part of a structured rehab program such as a stroke-specific rehab program, and patients less than 18 years old. Study quality was assessed using the PEDro scale. Primary outcome measures examining quality of life (QOL) included the Short Form-36 (SF-36) and Euroqol-5D (EQ-5D). Secondary outcomes included the Rivermead Mobility Index, 6 Meter Walk Test, and the Timed Up and Go to assess functional ability; and respiratory rate and dyspnea scale to measure respiratory function.

Results: A total of 1138 hits were reviewed, and five studies were selected for inclusion (see Figure 2). The mean quality of the studies was 6 out of 10 and the range was from 5 to 7 on the PEDro scale. Details of the studies are shown in Table 2. A total of 325 subjects were included in the five studies. Length of programs ranged from four weeks to six months. Three out of the five studies were supervised directly by a physical therapist. Two studies found improvements in SF-36 score for the domain "role physical." One study by Shelly et al. found improvements in SF-36 score for domains of "physical function," "bodily pain," and "general health." Subgroup analysis found improvement in QOL in cardiorespiratory patients using the EQ-5D in the study by Vitacca et al. Other studies found improvements in secondary outcomes in the cognitive domain. However, overall QOL did not improve in any of the studies.

Conclusion: While home-based physical rehabilitation as delivered in the included studies may benefit specific populations, such as those with respiratory impairments, or may benefit specific domains of QOL such as cognitive function, it does not appear to result in an overall improvement in QOL. However, given the limitations, additional research is needed to conclude if a home-based physical rehabilitation program can improve quality of life and physical functioning in patients after an ICU stay. Furthermore, with increasing COVID-19-related complications, we believe physical rehabilitation may be necessary to help regain function in these patients.

Table 1: Search terms

Database	Search Term
Cochrane Database of Systematic Reviews	home rehabilitation AND critical illness
Cochrane Database of Systematic Reviews	physical therapy AND critical illness
Medline	home physical therapy AND critical illness
Pubmed	((physical therapy) AND (critical illness)) AND (home health)
Pubmed	(physiotherapy) AND (critical illness)
Pubmed	(home health) AND (critical illness)
SportDiscus	physical therapy AND home program NOT Op
SportDiscus	physical therapy AND critical illness
SportDiscus	physical therapy home program NOT outpatient

Figure 1: PICS signs and symptoms

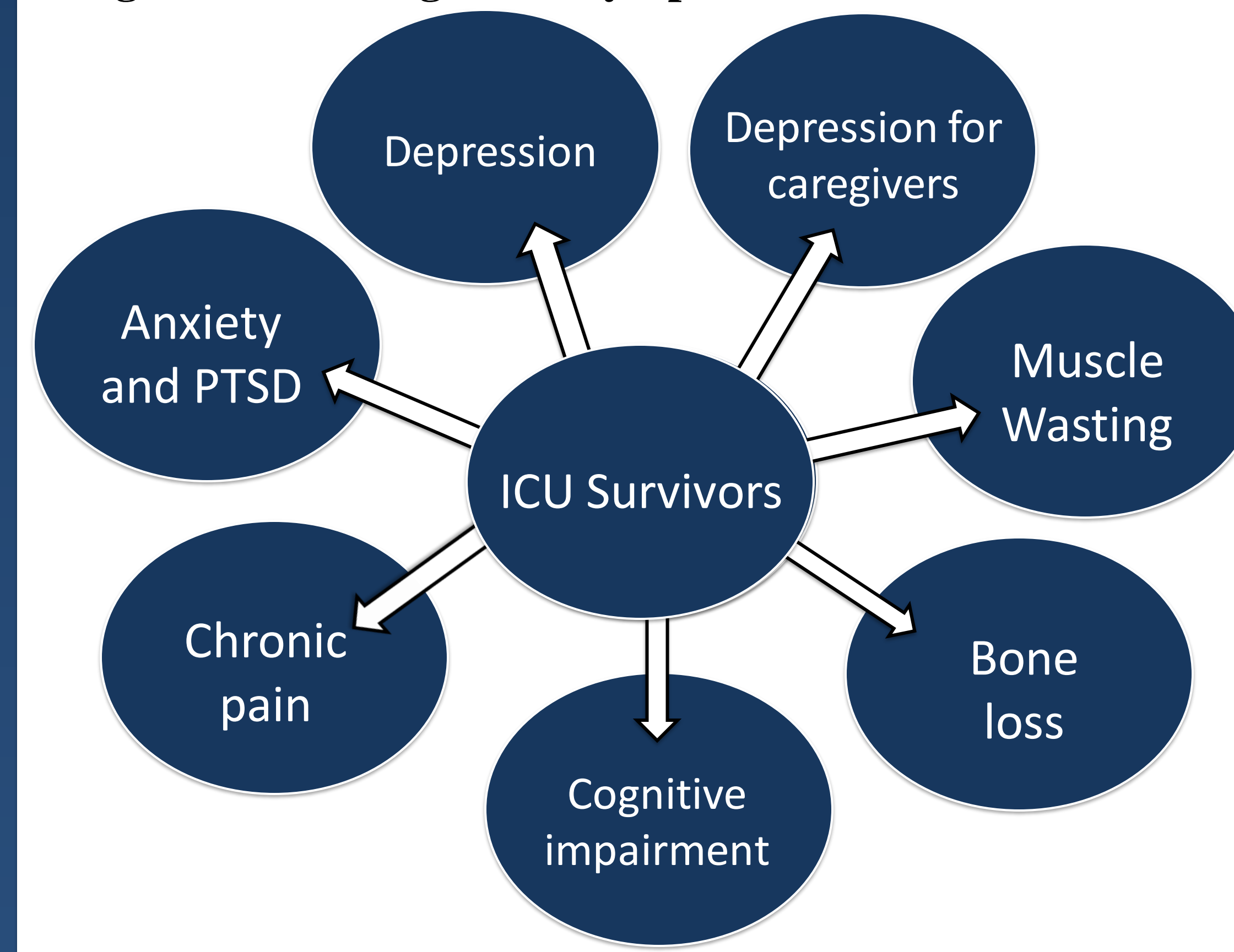
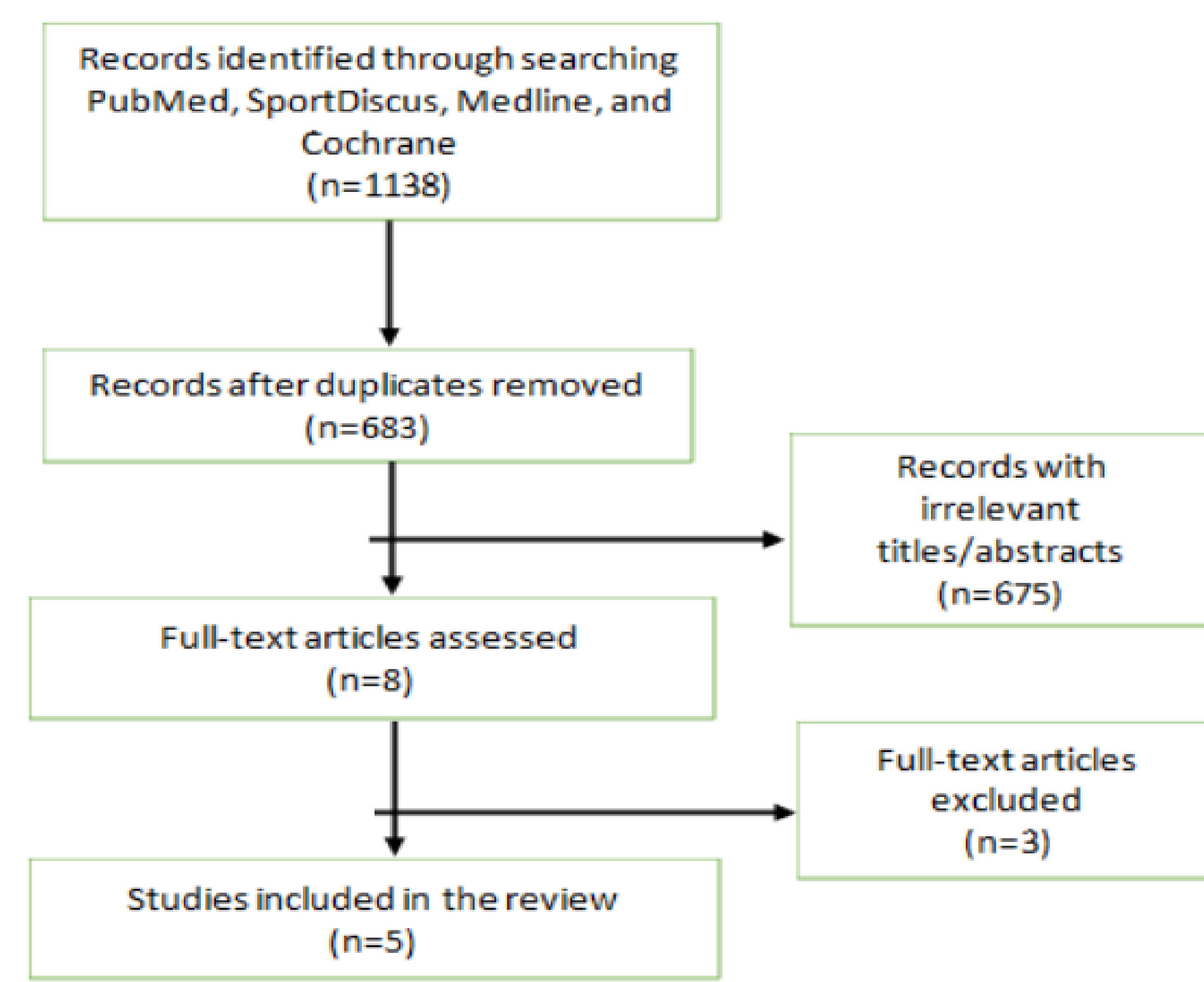


Figure 2: Search strategy



References:

- McDowell K, O'Neill B, Blackwood B, et al. Effectiveness of an exercise programme on physical function in patients discharged from hospital following critical illness: a randomized controlled trial (the REVIVE trial). *Thorax*. 2017;72(7):594-595. doi:10.1136/thoraxjnl-2016-208723
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- Shelly AG, Prabhu NS, Jirange P, Kamath A, Vaishali K. Quality of life improves with individualized home-based exercises in critical care survivors. *Indian journal of critical care medicine: peer-reviewed, official publication of Indian Society of Critical Care Medicine*. 2017;21(2):89-93
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- Elliott D, McKinley S, Alison J, et al. Health-related quality of life and physical recovery after a critical illness: a multi-centre randomised controlled trial of a home-based physical rehabilitation program. *Critical care (London, England)*. 2011;15(3):R142. doi:10.1186/cc10265



Table 2: Study interventions, outcome measures and findings

Author	Intervention	Outcome Measures Used	Conclusions
McDowell et al.	<ul style="list-style-type: none"> Standard care + personalized exercise program w/ 2 supervised (OP or home) & 1 unsupervised exercise session (home)/wk for 6 wks Warm up, circuit, aerobic ex, cool down 3-4 on Borg scale Exercise manual Delivered by trained PTs Outcomes taken @ 6 wks & 6 mo 	Primary Outcome <ul style="list-style-type: none"> PF subscale of SF-36 Secondary Outcomes <ul style="list-style-type: none"> SF-36 (RP) ISWT FLP Self-efficacy to ex Readiness to ex Rivermead Mobility Index Breathlessness: Medical Research Council Dyspnea Scale Chronic Disease Self-Efficacy Scale 	No lasting changes at 6 mo except readiness to exercise. At 6 wks improvements seen in ISWT and FLP may indicate that functional exercise capacity and health related QOL may improve immediately after exercise program. The RMI may have demonstrated a ceiling effect and therefore is not useful in determining effectiveness of improving mobility. Significant improvements in self-efficacy and behavior change was found at the end of the program as well.
Vitacca et al.	<ul style="list-style-type: none"> Meds, O₂, MV PRN Rehab instruments: study ex manual, pulse ox, activity diary, mini-ergometer, pedometer Pulm rehab program: 2 daily ex sessions 7d/wk under supervision of caregiver, PT determined program Daily rehab: 60-90 mins split into bronchial hygiene, PA (severely disabled & lesser disabled groups) *lesser disabled did 3x/wk Therapy home visits done at end of first mo, then PRN; phone support given weekly 	<ul style="list-style-type: none"> MIP/MEP Forced Volume (FEV1) Dyspnea RR Euroqol-5D Patient Adherence/Satisfaction 	Direct cardiopulmonary rehab added to a home exercise program shows benefit on resp mm strength respiratory function, dyspnea, QOL, outlook, and motivation in pts with primary cardiopulmonary conditions. However, still not enough detail to determine the effect on neurological pts after ventilator dependence during ICU stay.
Shelly et al.	<ul style="list-style-type: none"> 4 wks home-based training <ul style="list-style-type: none"> Respiratory session: 15 min, 5x/wk Mobility exercise: 15-20 min 2x/day 5x/wk, 10 reps/set Supervised by PT 	SF-36 Physical Component: <ul style="list-style-type: none"> PF RP Bodily Pain General Health PCS SF-36 Mental Component: <ul style="list-style-type: none"> Mental Health RE Social Function Vitality MCS 	Improvements found in mental and physical components of SF-36 show promising results that a 4-week home exercise program can be effective at improving QOL in pts after an ICU stay who were on MV. However, long term changes in QOL were not assessed.
Jackson et al.	<ul style="list-style-type: none"> 12 wks Total of 12 visits: 6 in-person visits for cog rehab & 6 tele-visits for physical & functional rehab Visits supplemented with brief phone calls by study personnel from relevant disciplines during alternate wks Participants completed workbook b/w visits to help track compliance Delivered by bachelor's level ex trainer, supervised by doctoral level ex physiologist 	<ul style="list-style-type: none"> TOWER Test TUG Mini-Mental State Exam Dysexecutive Questionnaire ABC scale Functional Activities Questionnaire Katz ADLs scale 	Intervention group pts had improvements in performance of IADLs (money management, travel arrangements) and cognitive function at 3 months compared to control group.
Elliott et al.	<ul style="list-style-type: none"> Graded, individualized, endurance & strength training intervention prescribed over 8 wks Wks 1, 3, 6, three physical trainers (qualified trainer, physiotherapist, ex physiologist or registered nurse with additional specific training for this project) home visit Wks 2, 4, 5, 7, F/U phone calls by physical trainer Pts supported by printed ex manual 	Outcome measures <ul style="list-style-type: none"> SF-36 6MWT HRQOL 	This individualized 8 wk home-based physical rehab program did not increase rate of recovery. Both groups of critically ill survivors improved physical function over 26 wks of follow-up.

Discussion:

Evidence from these five studies is insufficient to support that a home-based physical rehab program is beneficial in improving quality of life in patients who have been discharged from the ICU.

With regards to higher level tasks, Jackson et al. reported significant differences in executive function and improvement in IADLs and Shelly et al. also found significant improvements in cognitive function. Together, findings from these two studies implies the cognitive domain may improve with home-based physical rehabilitation. When looking specifically at respiratory changes after a supervised exercise program, there were significant improvements in dyspnea, respiratory muscle strength, and respiratory muscle function¹⁵ when the program included pulmonary rehabilitation as a component of the physical rehabilitation program.

Limitations in this REA include a relatively small number of studies (five), relatively small sample size (325 subjects), lower quality RCTs (PEDro scale scores 5-7) and heterogeneous mix of patient diagnoses and rehab programs. Reasons why this REA did not find significant changes in QOL and physical function include: the outcome measures used were not sensitive enough to detect change in QOL, the supervision from healthcare professionals given to the subjects of the studies was inadequate, and the intensity of the programs used in the studies was insufficient.