Supplementary Online Content

Walsh TS, Salisbury LG, Merriweather JL, et al; RECOVER Investigators. Increased hospital-based physical rehabilitation and information provision after intensive care unit discharge: the RECOVER randomized clinical trial. *JAMA Intern Med*. Published online April 13, 2015. doi:10.1001/jamainternmed.2015.0822.

This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Mean (SEM) proportion of hospital days after ICU discharge on which the main mobility treatments were delivered to patients in each trial group

Type of mobility exercise	Mean (SEM) proportion of post-ICU hospital days on which treatment was delivered to patient	
	Intervention group	Usual care group
Transfer practice	32 (3)	20 (2)
Walking practice	47 (3)	29 (2)
Exercises	34 (2)	9 (1)
Balance Work	15 (2)	5 (1)
Stair practice	12 (1)	7 (1)
Mobility Advice	14 (2)	6 (1)

For each patient, the proportion was calculated as the percent of all days spent in hospital post-randomization, which was a highly skewed distribution. Days on which a patient was unable to comply with a treatment and did not receive it were not counted as treatment days.

eTable 2. Treatment types received during post-ICU hospital stay classified by rehabilitation specialty

Exposure to therapy type (Specialist and GRA combined) by week in hospital	Usual Care Group	Intervention Group
Week 1 N (%)		
Patients still in hospital	120	120
Dietetics	67 (56)	116 (97)
OT	16 (13)	32 (27)
PT	107 (89)	119 (99)
SLT	17 (14)	20 (17)
Individualised goal setting	0 (0)	65 (54)
Week 2 N (%)		
Patients still in hospital	83	84
Dietetics	43 (52)	80 (95)
OT	14 (17)	28 (33)
PT	64 (77)	81 (96)
SLT	7 (8)	10 (12)
Individualised goal setting	0 (0)	55 (66)
Week 3 N (%)		
Patients still in hospital	46	53
Dietetics	29 (63)	50 (94)
OT	13 (28)	23 (43)
PT	39 (85)	52 (98)
SLT	4 (9)	7 (13)
Individualised goal setting	0 (0)	36 (68)
Week 4 N (%)		
Patients still in hospital	30	35
Dietetics	22 (73)	34 (97)
OT	7 (23)	13 (37)
PT	26 (87)	34 (97)
SLT	3 (10)	5 (14)
Individualised goal setting	0 (0)	24 (69)
Week 5 N (%)		
Patients still in hospital	20	22
Dietetics	13 (65)	22 (100)
OT	7 (35)	8 (36)
PT	18 (90)	22 (100)
SLT	1 (5)	4 (18)
Individualised goal setting	0 (0)	15 (68)

. For each week total patient numbers in each group represent those patients still in hospital. For each specialism type a patient was defined as receiving that therapy type if it was delivered at least once, based on a pre-defined taxonomy to describe therapy types during the trial. The therapies were delivered by specialist staff for the usual care group or specialist staff and/or the dedicated rehabilitation assistant for the intervention group. The proportions do not reflect treatment intensity or sub-type; these are described in table 2 (main manuscript) and table 1e (above). An individualised goal was defined as an agreed, documented patient-centred rehabilitation goal (for example a specific activity). OT, occupational therapy; PT, physiotherapy; SLT, speech and language therapy.

eTable 3. Secondary outcome measures at 6- and 12-month follow-up

Outcome (No. of evaluable patients)	Usual Care	Intervention	Difference in mean scores (95% CI)	P-value
6 month outcomes				
RMI (Usual care N = 87; intervention N = 98)[1]	13 (7, 15)	14 (7, 14)	-0.5 (-2.0 to 1)[1]	0.49
Death N (%) (Usual care N = 87; intervention N = 98)[1]	10 (12)	10 (10)		0.99
SF-12 PCS Median (1st, 3rd quartile) (Usual care N = 80; intervention N = 84)	33 (25, 45)	38 (26, 47)	-2.4 (-6.0 to 1.2)[1]	0.18
SF-12 MCS Median (1st, 3rd quartile) (Usual care N = 80; intervention N = 84)	43 (34, 54)	43 (34, 54)	-0.3 (-4.2 to 3.7)[1]	0.89
HADS (Anxiety) Score Median (1st, 3rd quartile) Proportion ≥8 (%) (Usual care N = 80; intervention N = 84)	6 (3, 11) 36	8 (3, 11) 57	-0.18 (-0.7 to 0.4)[1]	0.52
HADS (Depression) Score Median (1st, 3rd quartile)) Proportion ≥8 (%) (Usual care N = 80; intervention N = 84)	6 (2, 10) 44	7 (3, 10) 50	-0.12 (-0.6 to 0.4)[1]	0.64
DTS (PTSD) Score Median (1st, 3rd quartile) Proportion ≥27 (%) (Usual care N = 72; intervention N = 75)	29 (14, 67) 49	28 (6, 57) 52	5.0 (-3 to 15.)[1]	0.23
12 month outcome				
RMI (Usual care N = 91; intervention N = 94)	13 (7, 15)	14 (9, 15)	-0.6 (-2.1 to 0.95)	0.47
Death N (%) (Usual care N = 91; intervention N = 98)	11 (12)	11 (12)		1.00
SF-12 PCS Median (1st, 3rd quartile) (Usual care N = 76; intervention N = 79)	37 (27, 46)	36 (28, 51)	-2.0 (-5.9 to 1.9)	0.32

SF-12 MCS Median (1st, 3rd quartile) (Usual care N = 76; intervention N = 79)	43 (43, 66)	46 (34, 55)	-1.7 (-5.4 to 2.0)	0.36
HADS (Anxiety) Score Median (1st, 3rd quartile) Proportion ≥8 (%) (Usual care N = 77; intervention N = 81)	7 (4, 10) 45	7 (3, 12) 49	-0.1 (-1.7 to 1.4)	0.89
HADS (Depression) Score Median (1st, 3rd quartile) Proportion ≥8 (%) (Usual care N = 77; intervention N = 81)	6 (3, 9) 40	7 (2, 10) 46	-0.13 (-1.6 to1.3)	0.86
DTS (PTSD) Score M Median (1st, 3rd quartile)) Proportion ≥27 (%) (Usual care N = 70; intervention N = 72)	31 (6, 58) 54	26 (7, 59) 50	0.0 (-8.0 to10.0)	0.83

RMI, Rivermead Mobility Index; SF-12 PCS, Short Form 12 Physical Component Score; SF-12 MCS, Short Form 12 Mental Component Score; HADS, Hospital Anxiety and Depression Scale; DTS, Davidson's Trauma Scale. [1]17 patients withdrew and the remaining 38 did not respond.

eTable 4. Number (proportion) of patients responding “yes” to each component of the RMI at each measurement

Rivermead Mobility Index Question		**Baseline**		**Hospital Discharge**		**3 months**		**6 Months**		**12 months**	
		Usual Care (n = 120)	Intervention (N = 120)	Usual Care (N = 84)	Intervention (N = 83)	Usual Care (N = 110)	Intervention (N = 118)	Usual Care (N = 90)	Intervention (N = 99)	Usual Care (N = 91)	Intervention (N = 94)
1	Do you turn over from your back to your side without help?	84 (70)	81 (68)	72 (86)	77 (93)	101 (92)	110 (93)	78 (87)	85 (86)	78 (86)	80 (86)
2	From lying in bed, are you able to get up to sit on the edge of the bed on your own?	58 (48)	49 (41)	71 (85)	71 (86)	99 (90)	109 (92)	76 (84)	85 (86)	77 (85)	80 (86)
3	Could you sit on the edge of the bed without holding on for 10 seconds?	78 (65)	86 (72)	79 (94)	73 (88)	98 (89)	106 (90)	74 (82)	84 (85)	75 (82)	82 (88)
4	Can you (using hands and an aid if necessary) stand up from a chair in less than 15 seconds, and stand there for 15 seconds?	57 (48)	54 (45)	71 (85)	69 (83)	97 (88)	109 (92)	71 (79)	80 (81)	69 (76)	78 (83)
5	Observe patient standing for 10 seconds without any aid.	42 (35)	44 (37)	55 (65)	64 (77)	95 (86)	106 (90)	73 (82)	83 (84)	69 (77)	79 (84)
6	Are you able to move from bed to chair and back without any help?	46 (38)	40 (33)	66 (79)	63 (76)	97 (88)	108 (92)	72 (80)	80 (81)	74 (81)	77 (83)
7	Can you walk 10 metres with an aid if necessary but with no standby help?	34 (28)	30 (25)	60 (71)	58 (70)	96 (87)	107 (91)	69 (77)	78 (79)	74 (81)	75 (80)
8	Can you manage a flight of steps alone, without help?	0 (0)	2 (2)	27 (32)	35 (42)	79 (72)	87 (74)	56 (62)	61 (62)	55 (60)	61 (65)
9	Do you walk around outside alone, on pavements?	1 (1)	1 (1)	9 (11)	15 (18)	78 (71)	85 (72)	56 (62)	65 (66)	58 (64)	67 (72)
10	Can you walk 10 metres inside with no caliper, splint or aid and no standby help?	12 (10)	13 (11)	28 (33)	29 (35)	83 (75)	95 (81)	58 (64)	73 (74)	65 (71)	67 (71)

11	If you drop something on the floor, can you manage to walk 5 metres to pick it up and walk back?	10 (8)	10 (8)	31 (37)	36 (43)	79 (72)	90 (76)	56 (63)	69 (70)	62 (68)	70 (74)
12	Can you walk over uneven ground (grass, gravel, dirt, snow or ice) without help?	0 (0)	1 (1)	4 (5)	8 (10)	66 (60)	63 (53)	46 (52)	57 (58)	47 (52)	54 (58)
13	Can you get in and out of a shower or bath unsupervised, and wash yourself?	18 (15)	17 (14)	46 (55)	42 (51)	79 (72)	80 (68)	57 (63)	68 (69)	58 (64)	66 (70)
14	Are you able to climb up and down four steps with no rail but using an aid if necessary?	0 (0)	1 (1)	13 (15)	24 (29)	71 (65)	74 (63)	58 (64)	65 (66)	58 (64)	59 (63)
15	Could you run 10 metres in 4 seconds without limping? (A fast walk is acceptable.)	0 (0)	1 (1)	1 (1)	0 (0)	27 (25)	26 (22)	29 (32)	33 (33)	36 (40)	43 (46)

eTable 5. Descriptive statistics for costs and effects for the usual care and intervention groups

	Usual Care Group						Intervention group					
	N	Mean	SD	Median	Min	Max	N	Mean	SD	Median	Min	Max
Baseline Cost	120	29820	27106	23193	0	192864	120	28840	23718	21730	0	149581
Total Cost	120	49057	44238	38031	9655	303570	120	48953	39806	38732	6735	249395
QALY	75	0.539	0.181	0.538	0.038	0.849	82	0.539	0.195	0.572	0.040	0.864
MI QALY[1]	120	0.539	0.159	0.537	0.038	0.849	120	0.536	0.172	0.557	0.040	0.864

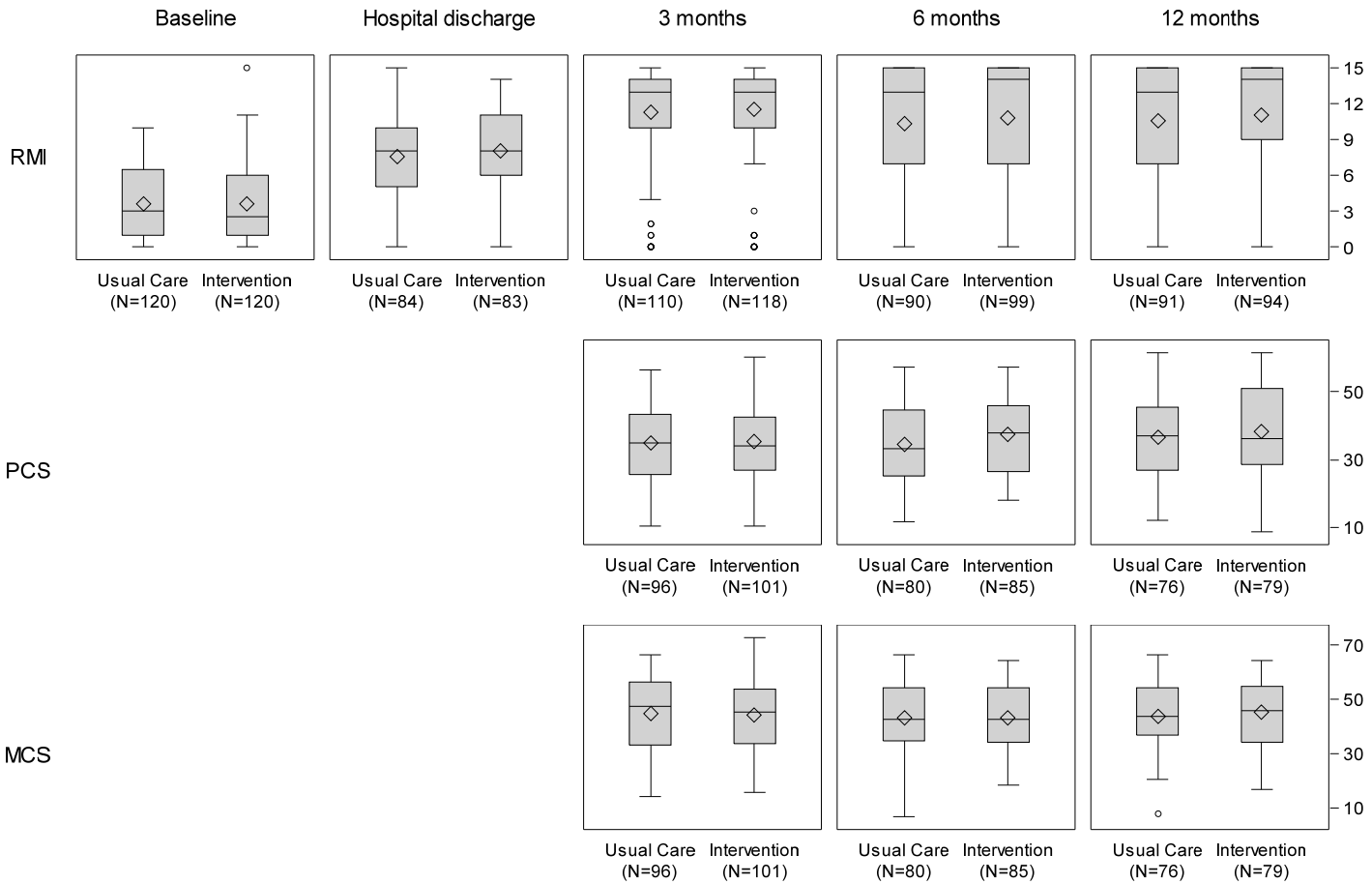
Total cost is defined as all secondary care admissions/attendance from the date of randomization to 1 year follow-up. Monetary values were assigned to the primary care/questionnaire data collected during the trial, but this was not included in the final analysis due to the magnitude and pattern of this missing data. The baseline cost is defined as secondary care patient resource-use prior to randomization (primarily ICU-related costs) and was included as a separate variable. This variable was not included in the reported analysis but was included as a covariate in the sensitivity analysis. The inclusion of the baseline cost variable in the regression model did not change the overall conclusion but it did slightly raise the costs for the GRA arm of the trial. The costing methodology for the secondary care resource-use was based on a per-diem approach using Scottish Health Service costs in line with the trial protocol paper.

[1]MI QALY represents QALYs based on the multiple imputation (MI) routine in Stata version 12.

eTable 6. Regression Results for Cost and Effect (N=240)

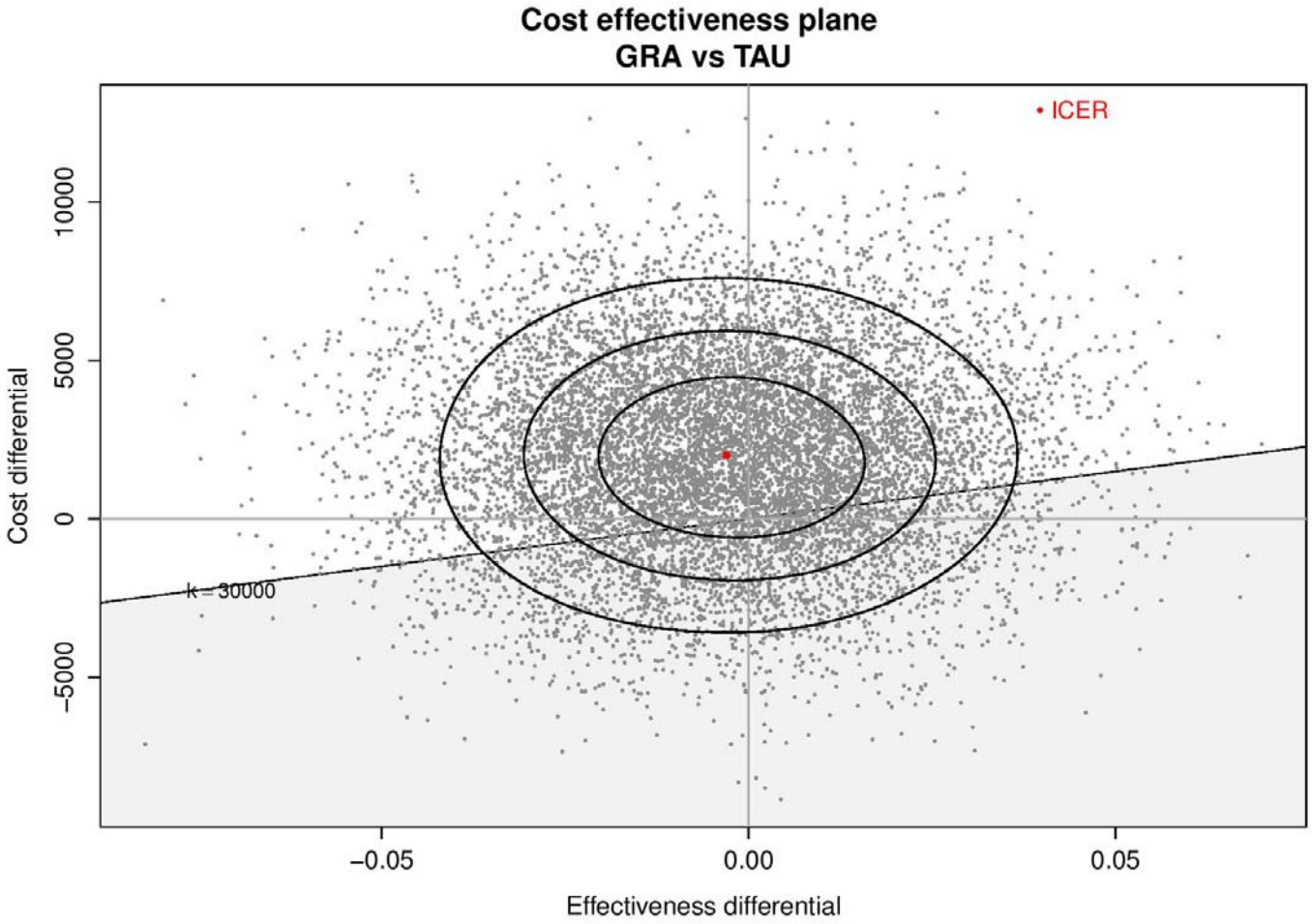
	Coefficient	S.E.	Lower CI	Upper CI
Cost Equation				
Treatment	2107	3040	-3883	8096
Constant	37750	2150	33515	41985
HRQoL Equation				
Treatment	-0.0029	0.0214	-0.0448	0.0390
Constant	0.5388	0.0152	0.5091	0.5686

eFigure 1. Box and whisker plots showing the distribution of Rivermead Mobility Index (RMI) scores over the course of the study from randomization to 12 months after randomization and the distribution of SF-12 PCS and MCS at 3, 6, and 12 months after randomization



.Diamonds show mean values.

eFigure 2. Incremental Cost-Effectiveness Plane (n=240). The point estimate for the Incremental Cost Effectiveness Ratio (ICER), shown as a red circle indicates the intervention was not cost effective. GRA, intervention; TAU, usual care group.



eAppendix. Summary of Health Economic Evaluation

An economic component was integrated into the study to evaluate the cost-effectiveness of the intervention from the perspective of the UK NHS on the basis of intention-to-treat.

The mean cumulative cost for the intervention group was £48,953 compared to £49,057 for the control group (see table e5). An analysis of the distribution of cost illustrated that this potential cost differential in favour of the intervention was illusory, and was driven solely by the skewed distribution of cost and the long right hand tail of the control group.

Robust and generalised linear regression models were used to account for the skewed cost distribution and estimate any additional costs associated with delivering the intervention. The point estimate from the regression model considered the intervention to lead to an additional £2,107 although this was not significantly different from zero (95% CI: -£3883 to £8096). Table e6 presents the regression results for the analysis of cost and health-related quality of life (HRQoL) as measured by SF-12v2. Exploratory analyses were undertaken to assess whether cumulative costs and quality-adjusted life years (QALYs) should be simultaneously estimated given the potential dependence between the two variables. The results from the Breusch-Pagan Test of Independence suggested that it was not possible to reject the assumption of independence. This result held for both complete-case and imputed SF-6D data. Cost and QALYs were, therefore, estimated independently and combined to report results on the cost-effectiveness for all model specifications and sensitivity analyses. Figure 2e presents the incremental cost-effectiveness plane based on the multiple imputation of missing quality of life data.

Mean imputation was used for two observations (one from each treatment group) which did not have any hospital cost estimates due to missing discharge data. The pattern of missingness for SF-6D, which was used in the construction of QALYs, was explored to assess if the variables exhibited a monotone pattern of missingness. Multivariate imputation by chained equations was used to address missing data on SF-6D at 3, 6 and 12 months. Sensitivity analysis of imputation methods were undertaken by adopting alternative imputation methods, such as univariate regression based models and predictive mean matching. The results were qualitatively similar across all imputation approaches. However, the results for the quality of life gains for the complete-case analysis were sensitive to the imputation of SF-6D utility values for patient deaths. If deaths are excluded from the analysis, the intervention was estimated to lead to an additional five days in good health over the one year trial period. The results from the complete-case analysis considered the intervention to be more expensive and less effective once patient deaths were included in the HRQoL equation. Furthermore, the results based on the imputed SF-

6D data also estimated the intervention to be more expensive and less effective, as illustrated with the point estimate of the incremental cost-effectiveness ratio (ICER) lying in the North West quadrant in Figure 2e. The interpretations of the health economic results remain persistent and persuasive that the intervention should not be considered for implementation in the UK NHS based on this analysis. This rationale is reflected in the ICER for the complete case analysis being dominated by usual care and the intervention being well in excess of conventional willingness to pay levels.

The study prioritised data collection and follow-up of the primary clinical outcome. One consequence of this approach was that there were concerns regarding the quality of primary care resource-use data, which relied on completion of questionnaires by participants. There was a significant proportion of missing data across primary care use of patient services, which limited the applicability of multiple imputation methods. The results for the cumulative costs were, therefore, confined to secondary care. This approach does not limit the generalisability of the results as the magnitude of the cost differential for primary care resource use will be dominated by the secondary care needs for the study population.

