StrokeImprovement



Stroke Rehabilitation A National View

Damian Jenkinson

Consultant Stroke Physician Royal Bournemouth & Christchurch NHS Foundation Trust

National Clinical Lead NHS Stroke Improvement Programme

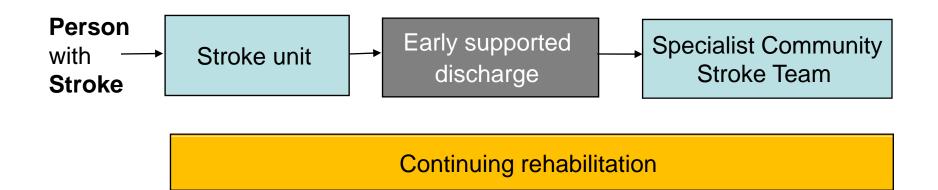
Strokelmprovement Rehabilitation After Stroke



NHS Improvement **NHS**

StrokeImprovement

NHS Improvement NHS



Long term support and re-assessment of needs

StrokeImprovement

NHS Improvement **NHS**



- 1. Stroke Units
- 2. Early Supported Discharge
- 3. Out Patient Stroke Services
- 4. Community Occupational Therapy

StrokeImprovementNHS ImprovementStroke Interventions: Public Health Implications

Intervention	Absolute Risk Reduction for death and dependency	Eligible proportion of stroke patients	Death and dependency avoided in all stroke
Stroke Unit	5.6%	100%	5.6%
Early Supported Discharge	5.5%	40%	2.2%
Aspirin <48h	1.2%	85%	1.0%
rt-PA <3h	13.1%	10%	1.3%
Hemicraniectomy <48h	22.7%	0.5% Adapted fr	0.1% rom Gilligan et al 2005

StrokeImprovement NHS Improvement Stroke Unit Trialists' Collaboration

"Stroke patients who receive organised inpatient care in a Stroke Unit are more likely to be alive, independent, and living at home one year after the stroke."

Cochrane Library 2006

StrokeImprovement NHS Improvement What is organised Stroke Unit care?

All SUs

- Multidisciplinary meetings at least weekly to plan patient care
- Provision of information to patients about stroke
- Continuing education programmes for staff
- Formal links with patient and carer organisations
- Consultant physician with responsibility for stroke

Acute/Combined SUs

- Continuous physiological monitoring (ECG, oximetry, blood pressure)
- Access to scanning within
 Access of admission
- 3 hours of admission
- Direct admission from A&E/front door
- Specialist ward rounds at least 5 times a week
- Acute stroke protocols/guidelines

StrokeImprovement Stroke Unit Care

NHS Improvement **NHS**

- 23 trials
- Death at 1 year
- Death or dependence
- Death or institution

RR 0.86 (0.71-0.94) RR 0.78 (0.68-0.89) RR 0.80 (0.71-0.90)

Independent of age, gender, severity

Cochrane Review,2006

StrokeImprovementNHS ImprovementStroke Rehabilitation Unit Evaluation10 year Follow Up

At 10 years:

- Death RR 0.87 (0.78-0.97)
- Death or dependence RR 0.99 (0.94-1.05)
- Death or institution RR 0.91 (0.83-1.00)

All tended toward more favourable outcome for stroke unit participants.

(Drummond et al, BMJ 2005)

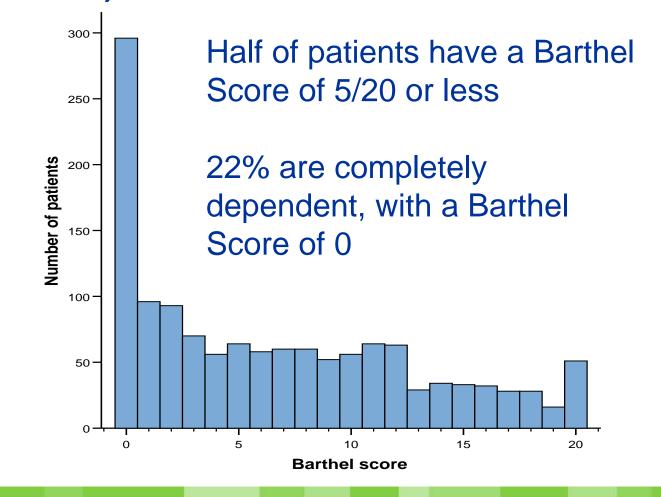
StrokeImprovement NHS Improvement Stroke Unit Workforce: Key facts

- Only 25% stroke units have adequate staff levels
- Patchy access to psychologists, dieticians and social care
- Only 20% recommended
 number of stroke physicians



- Until recently, no framework for nationally-recognised stroke-specialist courses or competences for nurses or AHPs
- Many staff in traditional unidisciplinary roles without training in leadership and effective teamworking

Strokelmprovement NHS Improvement DH/RCP Survey of Staffing Levels and Patient Dependency in 92 English Stroke Units (1398 patients)



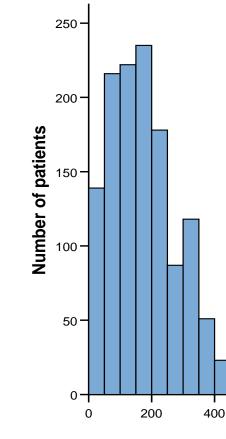
Strokelmprovement NHS Improvement DH/RCP Survey of Staffing Levels and Patient Dependency in 92 English Stroke Units (1398 patients)

600

800

Nursing contact (minutes)

1000



75% patients receive less than 4 hours nursing input each 24 hours

25% receive less than one and a half hours: equating to less than 4 minutes an hour

Almost a half of nurses providing this care are nursing assistants

1200

1400

Strokelmprovement NHS Improvement DH/RCP Survey of Staffing Levels and Patient Dependency in 92 English Stroke Units Proportion of patients receiving some contact from professions (%)

Discipline	Units (no.)	Median	IQR
Nursing	85	100%	100-100%
Physiotherapy	85	74%	59-90%
Occupational therapy	85	46%	33-63%
SLT	85	25%	9-41%

Strokelmprovement NHS Improvement DH/RCP Survey of Staffing Levels and Patient Dependency in 92 English Stroke Units (1398 patients)

Patient contact time for professions (minutes/day)

Discipline	Patients (no.)	Median	IQR
Nursing	1338	170	90-250
Physiotherapy	897	40	30-60
Occupational therapy	614	45	20-60
SLT	328	30	20-45

StrokelmprovementNHS ImprovementStaff Establishment in English Stroke Units:Existing Levels

	No. Working	g Time Equivale	ents of ead	ch Profes:	sion per 1	0 Bed Wa	ard
Profession	SUTC*	NSA*	BASP	BASP	UCLan	UCLan	DH – Survey*
			– ASU	– SRU	– ASU	– SRU	
Nurses	7-12	3.3 (2.9-3.7)^	8	10.1	8.5	12.8	10.9 (9.3-
							13.1)
Occupational	0.6-1.7 (1-	1 (0.7-1.3)	0.7	0.6	0.3	1.2	1.3 (0.8-1.6)
Therapists	1.3)						
Physiotherapis	1.2-1.7 (1-	1.3 (0.9-1.6)	0.9	0.8	2	3	1.7 (1.2-2.1)
ts	2)						
Speech and	0.25-0.75	0.3 (0.2-0.6)	0.35	0.25	0.2	0.4	0.4 (0.2-0.6)
Language	(0.2-0.6)						
Therapists							

*Median (IQR)

^Relates to number of staff on duty at a particular time per 10 bed unit

Strokelmprovement NHS Improvement Staff Establishment in English Stroke Units: Aspirational Levels

	No. Working Time Equiv	No. Working Time Equivalents of each Profession per 10 Bed Ward									
	Consensus	UCLan –	UCLan – SRU	DH – Survey							
	Statements	ASU									
Nurses	12.5	12.00	11.59	12.9							
Occupational Therapists	1 (ASU) 2 (SRU)	2.56	2.89	3.3							
Physiotherapists	3.74 (ASU) 4.67 (RSU)	3.22	3.40	3.7							
Speech and Language Therapists	1	1.89	1.14	1.4							
Psychologists		0.92	0.92								

Strokelmprovement Early Supported Discharge

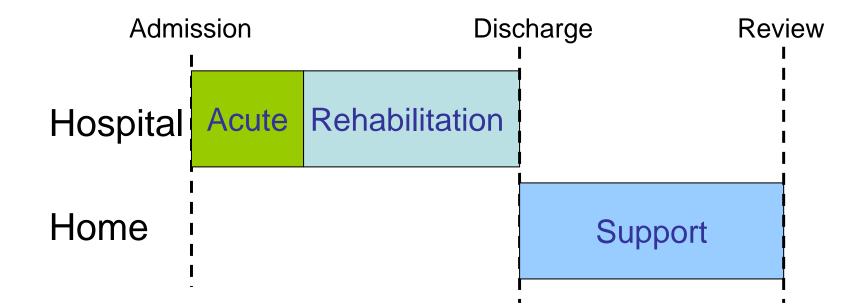


Early Supported Discharge Services for stroke patients: a meta-analysis of individual patient data.

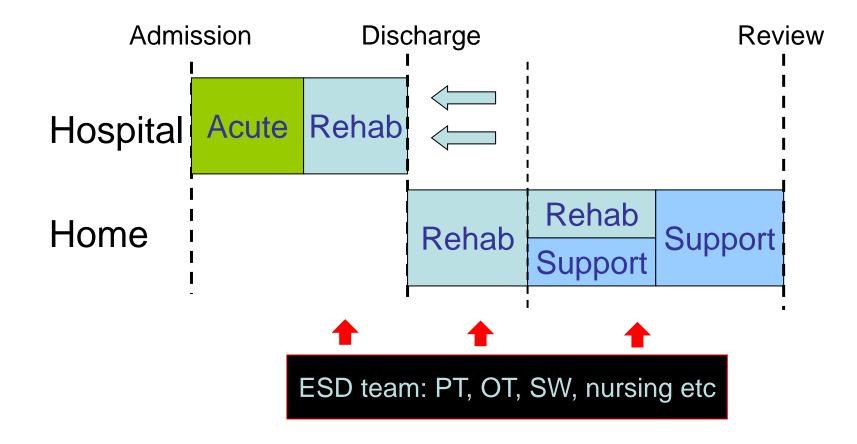
Langhorne et al, Lancet 2005



StrokeImprovement NHS Improvement Conventional Stroke Services

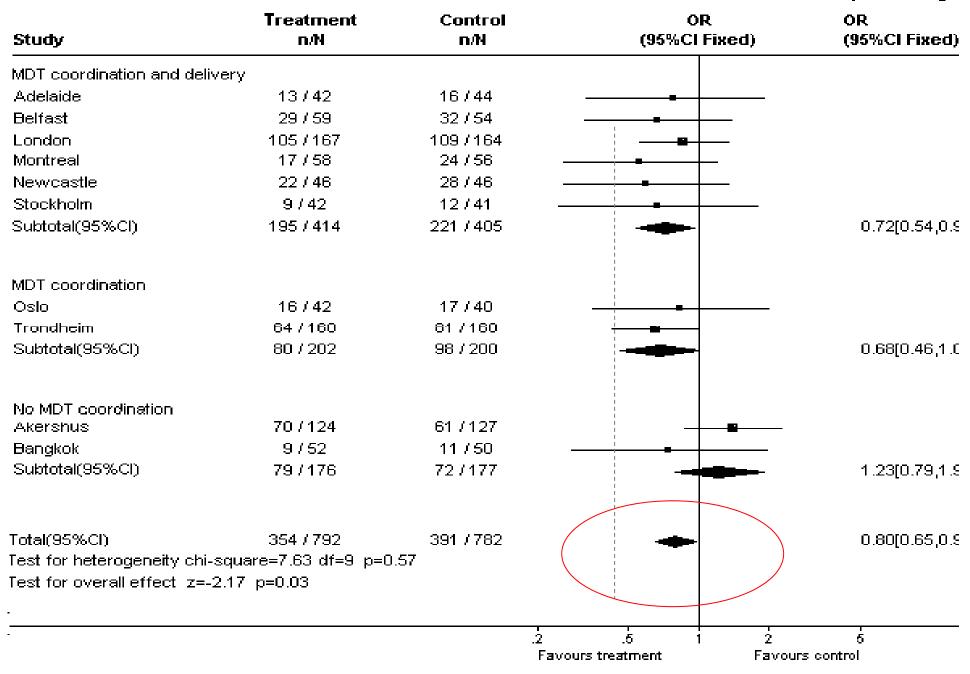


StrokeImprovement NHS Improvement Early Supported Discharge (ESD)



Strokelmprovement NHS Improvement Randomised trials of Early Supported Discharge services

- 12 completed randomised controlled trials
- Services aiming to accelerate discharge home and provide rehabilitation and/or support at home



Early supported discharge service vs Conventional care - Outcome Death or dependency

StrokeImprovementNHS ImprovementEarly Supported Discharge services



- Not applicable to all stroke patients (40-50%)
- Economically viable
- Best results with ESD services
 - coordinated and provided by a multidisciplinary rehabilitation team and
 - targeted at mild-moderate stroke patients



Consensus statements: Team composition

- Team Composition
- Stroke specialist, multidisciplinary
- For 100 patients per year caseload:
 - OT (1.0), Physio (1.0), SALT (0.4)
 - Physician (0.1), nurse (0-1.2), social worker (0-0.5),
 - Consensus not reached: Rehab assistant
- Interpretation: role of assistant depends on model of rest of team and overall remit of team

Research making a difference to practice



Consensus statements: Intervention

- Intervention
- Eligibility criteria
- Live safely at home, based on practicality and disability (Barthel score 10/20 to 17/20)
- Patients eligible for early supported discharge would be able to transfer safely from bed to chair <u>i.e. can</u> <u>transfer safely with one with an able carer, or</u> <u>independently if living alone.</u>
- Both hospital staff and ESD team staff should identify patients for ESD

Research making a difference to practice

StrokeImprovement **Outpatient Service Trialists**

NHS Improvement **NHS**



To assess the effects of therapy based rehabilitation services targeted towards stroke patients resident in the community within one year of stroke onset

The exact form (e.g. domiciliary, day hospital, outpatient clinic) was recorded but not used as an exclusion criterion.

Compared with conventional care (i.e. normal practice or no routine intervention)

- -14 trials
- Heterogeneous interventions
- Including 1617 patients

NHS Improvement NHS



StrokeImprovement **Outpatient Service Trialists**

"Patients receiving rehabilitation at home within one year of stroke onset are more likely to have a better outcome, in terms of independence and achievement of maximum level of function in all aspects of daily life."

Lancet 2004; 363: 352-356



Strokelmprovement Outpatient Service Trialists Personal ADL

Review: Therapy-based rehabilitation services for stroke patients at home Comparison: 1 Therapy-based rehabilitation versus no routine input Outcome: 5 Activities of daily living score

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% Cl
1 Mixed service Hong Kong 1995	43	17.1 (3.6)	44	15.6 (5.6)		7.7 %	0.32[-0.11, 0.74]
London 1981	72	31.95 (10)	35	30.5 (10)		8.4 %	0.14 [-0.26, 0.55]
Philadelphia 1997	20	103.6 (25.1)	20	102.5 (27.1)		3.6 %	0.04 [-0.58, 0.66]
South London 2000	15	17.33 (3.48)	17	18.52 (1.73)	• • •	2.8 %	-0.43 [-1.13, 0.27]
Subtotal (95% Cl) Heterogeneity: Tau ² = 0. Test for overall effect: Z			116 .36); l ² =8%		-	22.4 %	0.11 [-0.15, 0.37]
2 Physiotherapy Copenhagen 2000	44	85.7 (20.1)	43	77.5 (25.9)		7.6%	0.35 [-0.07, 0.77]
Kansas 1998	10	19.1 (4.7)	9	19.12 (5.3)		1.7%	0.00[-0.90, 0.90]
Subtotal (95% Cl) Heterogeneity: Tau ² = 0. Test for overall effect: Z	54 0; Chi² = 0.49 = 1.47 (P = 0.1	, df = 1 (P = 0.4 4)	52 8); I² =0.0%			9.3 %	0.29 [-0.10, 0.67]
3 Occupational therapy Cardiff 1995	46	12.3 (4.74)	39	10.87 (5.72)		7.5 %	0.27 [-0.16, 0.70]
Glasgow 2000	60	16.17 (3.76)	62	15.45 (4.48)		10.8%	0.17 [-0.18, 0.53]
Nottingham 1996	12	10.75 (3.86)	15	10.33 (4.19)		2.4 %	0.10[-0.66, 0.86]
Nottingham 1997	45	15.42 (4.64)	38	14.82 (3.97)		7.3 %	0.14 [-0.30, 0.57]
Nottingham 1999	84	18.44 (2.72)	79	17.35 (3.05)		14.3 %	0.38 [0.07, 0.69]
TOTAL 2001	218	15.77 (4.04)	110	16.08 (3.87)	— — —	26.1 %	-0.08 [-0.31, 0.15]
Subtotal (95% Cl) Heterogeneity: Tau ² = 0. Test for overall effect: Z			343 .30); l² =17%	6	•	68.3 %	0.14 [-0.02, 0.30]
Total (95% Cl) Heterogeneity: Tau ² = 0. Test for overall effect: Z			511 0.49); l ² =0.	0%	•	100.0 %	0.14 [0.02, 0.25]
				Favours contr	-1 -0.5 0 0.5 I Favours treat	1 ment	



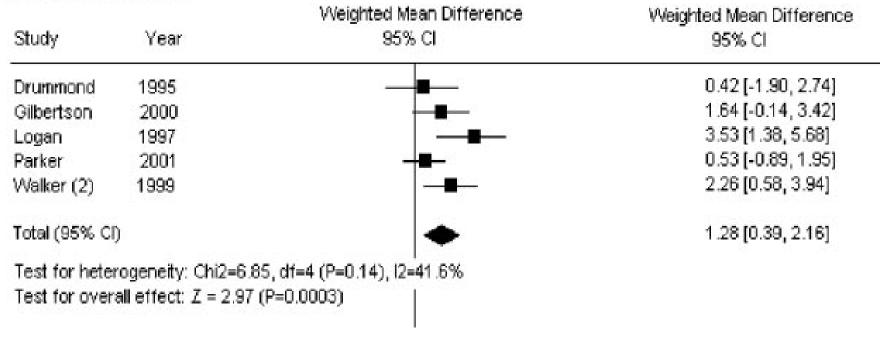
Strokelmprovement Outpatient Service Trialists Extended ADL

Review: Therapy-based rehabilitation services for stroke patients at home Comparison: 1 Therapy-based rehabilitation versus no routine input Outcome: 6 Extended activities of daily living scores

Study or subgroup	Treatment N	C Mean(SD)	ontrol N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 Mixed service Philadelphia 1997	21	31 (8.3)	21	31.1 (10.7)		4.5 %	-0.01 [-0.62, 0.59]
Subtotal (95% Cl) Heterogeneity: not appli Test for overall effect: Z		97)	21			4.5 %	-0.01 [-0.62, 0.59]
2 Physiotherapy Copenhagen 2000	44	12 (7.8)	43	10.9 (8.9)		9.2 %	0.13[-0.29, 0.55]
Kansas 1998	10	22 (3.8)	10	22.2 (3.8)		2.1 %	-0.05 [-0.93, 0.83]
Subtotal (95% Cl) Heterogeneity: Tau ² = 0 Test for overall effect: Z			53 ; l² =0.09	⁶		11.4 %	0.10 [-0.28, 0.48]
3 Occupational therapy Cardiff 1995	45	5.73 (5.1)	39	5.1 (6)		8.9 %	0.11 [-0.32, 0.54]
Glasgow 2000	60	28.33 (15.72)	62	26.58 (16.47)		12.9%	0.11 [-0.25, 0.46]
Nottingham 1995	41	31.26 (15.93)	23	25.43 (17.2)		6.2 %	0.35 [-0.16, 0.87]
Nottingham 1997	45	8.36 (5.89)	38	6.63 (4.83)		8.7 %	0.32 [-0.12, 0.75]
Nottingham 1999	84	42.95 (15.05)	79	34.67 (17.73)		16.7%	0.50 [0.19, 0.81]
T0TAL 2001	219	33.38 (18.45)	112	33.3 (19.5)		30.7 %	0.00[-0.22, 0.23]
Subtotal (95% Cl) Heterogeneity: Tau² = 0 Test for overall effect: Z			353 9); I ² =33	%	•	84.1 %	0.21 [0.03, 0.39]
Total (95% Cl) Heterogeneity: Tau ² = 0 Test for overall effect: Z	5 69 .00; Chi ² = 8.1 = 2.57 (P = 0.(0, df = 8 (P = 0.4; 010)	427 2); ² =1%	i	•) 100.0 %	0.17 [0.04, 0.30]
				- Favours control	1 -0.5 0 0.5 Favours treatm	1 ent	

Strokelmprovement NHS Improvement Individual Patient Data Meta-analysis of Community OT trials

Nottingham Extended Activities of Daily Living at end of intervention



(Walker et al, Stroke 2004)

Strokelmprovement NHS Improvement Home-Based or Centre-Based Rehabilitation for Community Dwellers?

Barthel Index at 6-8 weeks post-intervention

	Home Centre							Mean Difference	N	lean Differ	ence	
Study or Subgroup	Mean	SD	Tota	Mean	SD	Total	Weight	IV, Random, 95% C		/, Random	, 95% C	
Gilbertson 2000	18	3	67	17	3.75	71	61.3%	1.00 [-0.13, 2.13]			-	
Young 1991	16	2.625	57	15	4.5	50	38.7%	1.00 [-0.42, 2.42]		+•	F	
Total (95% Cl)			124			121	100.0%	1.00 [0.12, 1.88]		•	•	
Heterogeneity: Tau ² =	0.00; C	$hi^2 = 0.0$	0, df =	1 (P = 1)	1.00); I	² = 0%			H			
Test for overall effect:	Z = 2.22	(P = 0,	03)					-	-10 —5	0	5	10
			,						Favours co	ontrol Fa	vours expe	rimenta

Barthel Index at 3-6 months post-intervention

	Home Centre							Mean Difference		Mean Difference			
Study or Subgroup	Mean	SD	Total	Mean	SD	Tota	Weight	IV, Random, 95% C		IV, Rar	ndom,	, 95% Cl	
Andersen 2000 (PT)	80,6	17.4	53	76.8	23.7	24	15.9%	3.80 [-4.38, 11.98]			-		
Andersen 2000 (Dr)	81.5	19	54	76.8	23.7	24	15.1%	4.70 [-3.70, 13.10]	i		+	•	
Baskett 1999	6.5	9.5	46	2.5	9.5	44	69.0%	4.00 [0.07, 7.93]					
Total (95% Cl)			153			92	100_0%	4.07 [0.81, 7.34]					
Heterogeneity: Tau ² =	0.00; Ch	$h^2 = 0.1$	03, df =	2 (P =	0.99);	² = 0%	Þ		⊢				—
Test for overal effect:									-20	-10	0	10	20
		·. ·							F	avours control	Favo	ours experi	imenta

Hillier and Inglis-Jassiem, 2010, Int J Stroke

Strokelmprovement MHS Improvement MHS Improvement MHS Improvement Rehabilitation for Community Dwellers?

Barthel Index at 6/12 post-intervention

	H	lome		Ce	entre			Mean Difference	Mean Difference
Study or Subgroup	Mean	SD	Tota	Mean	SD	Tota	Weight	V, Random, 95% C	V, Random, 95% C
Gilbertson 2000	17	3	67	17	3.75	67	18.1%	0.00 [-1.15, 1.15]	-+-
Gladman 1993	17	3.75	162	18	3.75	165	19.8%	-1.00 [-1.81, -0.19]	-8-
Lincoln 2004	16	4.5	90	16	5.25	103	16.8%	0.00 [-1.38, 1.38]	_ + _
Roderick 2001	17	6.15	54	15.5	6.75	58	11.3%	1.50 [-0.89, 3.89]	
Walker 1999	20	1.5	20	18	3	18	15.8%	2.00 [0.47, 3.53]	e
Young 1991	17	3	56	15	3	52	1 8. 2%	2.00 [0.87, 3.13]	-8-
Total (95% CI)			449			463	100.0%	0.65 [-0.50, 1.81]	•
Heterogeneity: Tau ² =	1,58; C	hi² = 2	4.61, d	f = 5 (P	= 0,00	02); ²	= 80%	H	
Test for overall effect:								-10	-5 0 5 10 Favours control Favours experimental

Hillier and Inglis-Jassiem, 2010, Int J Stroke

Strokelmprovement NHS Improvement Effects of Augmented Exercise Therapy Time After Stroke

- 20 trials, n=2686
- Small but significant effect in ADL function in first 6 months after stroke
- 5% change in outcome in Barthel Index
- No ceiling effect for therapeutic intensity

Kwakkel et al, 2004

"Patients should be given the opportunity to repeatedly practice functional skills and activities"

RCP Stroke Clinical Guidelines 2004

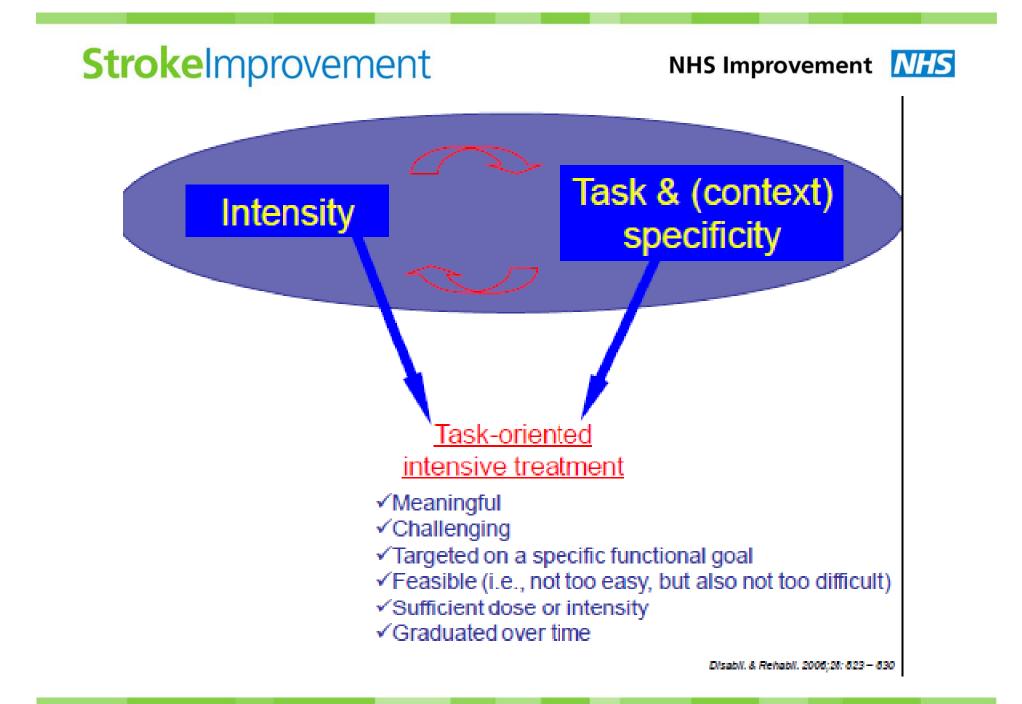
University of Glasgow Very Early Mobilisation (VEM) in stroke: pooled analysis of two randomised controlled trials*

Results: Independence at 3 months

- Greater proportion of VEM patients were independent at three months than the Standard Care (SC) group
- Patients who underwent VEM were 3-4 times more likely to be independent at three months than SC patients

Independence	Unadjusted OR (95%CI)	Adjusted OR (95%CI)
Modified Rankin Score (0-2)	2.02 (0.89, 4.60)	3.11(1.03, 9.33)
Barthel Index (18-20)	2.90 (1.24, 7.15)	4.41 (1.36,14.32)

*A Very Early Rehabilitation Trial (AVERT) phase II *Very Early Rehabilitation or Intensive Telemetry after Stroke (VERITAS)



Strokelmprovement MHS Improvement MHS Improvement MHS Improvement Arm function

Intervention or subcategory	Trials (number of participants)	SMD of outcom	ne scale (95% CI)	
Arm function				
Neurophysiological approaches ²⁴⁻²⁸ *	6(248)	-	-	
Bilateral training ^{30,31}	2 (111)	-	-	
CIMT ^{48-59,62-70}	21(508)			
EMG biofeedback ⁷¹⁻⁷⁴	4(126)			
Electrostimulation ⁹⁰⁻¹⁰²	13(277)		⊢ ∎−	
High-intensity therapy ¹²⁴⁻¹²⁷ †	6 (571)	-	-	
Mental practice ¹³¹⁻¹³⁴	4 (72)			
Repetitive task training ^{25,27,124,138-142}	8(414)			
Robotics ¹⁵⁰⁻¹⁵⁹	10 (255)			
Splinting or orthosis ¹⁶¹⁻¹⁶³ ‡	4 (105)	-	+ - -	
	-4	-7		4
	7	Favours control	Favours treatment	T

Langhorne, Coupar, Pollock. Lancet Neurol 2009

Strokelmprovement NHS Improvement CONStraint Induced Movement Therapy

Comprises

- 1. Forced use of the affected arm by restraining the unaffected arm, during dedicated exercise sections
- 2. Massed practice of the affected arm through a shaping method



Clinically effective in short term, but long term effects not yet clear

StrokeImprovement Robotics



Arm Guide

MIT MANUS

InMotion Shoulder Arm

NHS Improvement NHS





Strokelmprovement NHS Improvement NHS Improvement NHS Improvement Leg function

Intervention or subcategory	Trials (number of participants)	SMD of outcom	ne scale (95% CI)	
Sit-to-stand				
Biofeedback (force) ^{37,38}	2 (42)	-		
Repetitive task training ^{20,22,25,27,138,145,146}	7 (346)		■ ←	
Standing balance				
Mixed approaches ¹⁵⁻¹⁷	3 (127)	-	+	
Motor approaches ²⁰	1 (91)	-	┼┳╌	
Neurophysiological approaches ^{‡7}	1 (15)			
Biofeedback (force) ³³⁻³⁶	4 (161)			
Moving platform ^{135,136}	2 (40)			
Repetitive task training ^{20,143,144}	3 (132)		<mark>⊦</mark> ■-	
	-4	-2	0 2	4
	Fa	wours control	Favours treatment	

Langhorne, Coupar, Pollock. Lancet Neurol 2009

Strokelmprovement MHS Improvement MHS Improvement MHS Improvement Leg function

Intervention or subcategory	Trials (number of participants)	1 2
Gait (walking speed)		
Mixed approaches ^{15,16,18,19}	4 (350)	
Motor approaches ^{20–22}	3 (117)	
Neurophysiological approaches ^{17,27}	2 (113)	
Biofeedback (force) ³⁹	1 (41)	
Biofeedback (position) ^{40–44}	5 (165)	
EMG biofeedback ⁷⁵⁻⁷⁷	3 (36)	
Electromechanical-assisted gait training ^{82-85,07,88}	6 (328)	
Electrostimulation ¹⁰⁵⁻¹⁰⁹	5 (194)	+
Fitness (cardiorespiratory) ^{84,111-113}	4 (356)	— — — —
Fitness (mixed) ^{16,1722,17,119-122}	8 (332)	- • •
Fitness (strength) ¹¹⁶⁻¹¹⁸	3 (110)	
High-intensity therapy ^{17-19,124,128,129}	6 (524)	
Repetitive task training ^{20–22,27,124}	5 (263)	
Rhythmic gait cueing ^{43,147,148}	3 (121)	
Treadmill ^{88,114,115,176-180*}	10 (295)	
	-4	-2 0 2 4
		Favours control Favours treatment

StrokeImprovementNHS ImprovementStroke Rehabilitation - A National View

• Stick to the evidence base

 Emphasise intensive, taskorientated therapy

• Be Innovative!

