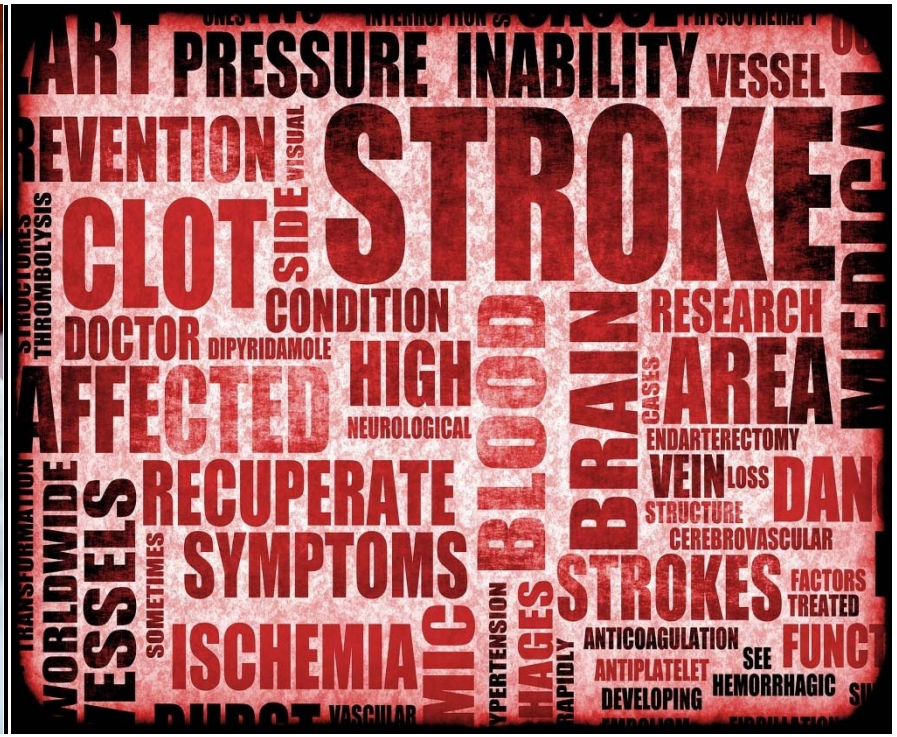
KCE REPORT 181S

Federaal Kenniscentrum voor de Gezondheidszorg
Centre Fédéral d'Expertise des Soins de Santé
Belgian Health Care Knowledge Centre

STROKE UNITS: EFFICACY, QUALITY INDICATORS AND ORGANISATION

APPENDIX



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HEALTH SERVICES RESEARCH

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APPENDIX

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COLOPHON

Title:	Stroke units: efficacy, quality indicators and organisation - Appendix
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	Peeters (Cliniques universitaires Saint-Luc, Bruxelles), Etienne Pendeville (Cliniques universitaires Saint-Luc, Bruxelles), Vincent Thijs (UZ Leuven), Yves Vandermeeren (Cliniques Universitaires UCL, Mont-Godinne), and Geert Vanhooren (AZ Sint Jan Brugge-Oostende) were consulted given their professional expertise in relation to stroke care. Therefore these experts have by definition possible conflicts of interest. Payments to speak, training remuneration, subsidised travel or payment for participation at a conference: Yves Vandermeeren (support from Boeringher); Geert Vanhooren (invited as expert for conferences).
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TABLE OF CONTENTS

1. SEARCH STRATEGIES

Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) <1948 to Present> (Date of search: 17/11/2011)

1 exp stroke/ (68881)
2 (stroke* or apoplexy or cerebrovascular accident* or brain vascular accident* or cvas or cva or cerebral vascular accident*).tw. (129247)
3 Ischemic attack, transient/ (16606)
4 (transient brainstem isch?emia* or transient cerebral isch?emia* or transient isch?emic attack* or tia or tias).tw. (11188)
5 exp cerebrovascular disorder/ (244218)
6 3 or 4 (22957)
7 2 and 6 (8847)
8 2 and 5 (72631)
9 1 or 7 or 8 (97950)
10 exp hospital units/ (67491)
11 *hospital, special/ (6058)
12 hospital departments/ (13779)
13 intensive care/ (13148)
14 ((inpatient adj3 care) or unit* or ward*).tw. (575494)
15 or/10-14 (632058)
16 9 and 15 (5527)
17 ((stroke adj3 unit*) or (stroke adj3 ward*) or (stroke adj3 team*) or inpatient stroke care or inpatient stroke management).tw. (2076)
18 16 or 17 (5822)
19 Randomized Controlled Trials as Topic/ (78000)
20 randomized controlled trial/ (322382)
21 Random Allocation/ (73633)
22 Double Blind Method/ (113969)
23 Single Blind Method/ (15763)
24 clinical trial/ (470464)
25 clinical trial, phase i.pt. (11888)
26 clinical trial, phase ii.pt. (18798)
27 clinical trial, phase iii.pt. (6701)
28 clinical trial, phase iv.pt. (670)
29 controlled clinical trial.pt. (84016)
30 randomized controlled trial.pt. (322382)
31 multicenter study.pt. (140010)
32 clinical trial.pt. (470464)
33 exp Clinical Trials as topic/ (252284)
34 or/19-33 (897551)
35 (clinical adj trial$).tw. (174044)
36 ((singl$ or doubl$ or treb$ or tripl$) adj (blind$3 or mask$3)).tw. (114686)
37 PLACEBOS/ (30721)
38 placebo$.tw. (139063)
39 randomly allocated.tw. (13788)
40 (allocated adj2 random$).tw. (16128)
41 or/35-40 (356657)
42 34 or 41 (1012785)
43 case report.tw. (176257)
44 letter/ (749641)
45 historical article/ (284364)
46 or/43-45 (1199942)
47 42 not 46 (985764)
48 18 and 47 (1202)
49 "outcome and process assessment (health care)"/ or "outcome assessment (health care)"/ or "process assessment (health care)"/ (62912)
50 program evaluation/ (39686)
51 quality indicators, health care/ (7925)

52 clinical indicator$.tw. (1786)
53 performance indicator$.tw. (1418)
54 performance outcome$.tw. (450)
55 quality indicator$.tw. (2954)
56 performance standard$.tw. (917)
57 quality measure*.tw. (2693)
58 outcome measure*.tw. (116356)
59 exp Quality Assurance, Health Care/ (225419)
60 benchmarking/ (8749)
61 or/49-60 (424663)
62 18 and 61 (1253)
63 62 not 46 (1226)
64 limit 48 to (yr="2006 -Current" and (dutch or english or french or german)) (513)
65 limit 63 to (yr="2000 -Current" and (dutch or english or french or german)) (989)

1.1.1.1. Database: Embase <1980 to 2011 Week 45> (Date of search: 17/11/2011)

1 Stroke/ (107321)
2 (stroke* or apoplexy or cerebrovascular accident* or brain vascular accident* or cvas or cva or cerebral vascular accident*).tw. (160509)
3 transient ischemic attack/ (19268)
4 (transient brainstem isch?emia* or transient cerebral isch?emia* or transient isch?emic attack* or tia or tias).tw. (14400)
5 exp cerebrovascular disease/ (345400)
6 3 or 4 (25111)
7 2 and 6 (11823)
8 2 and 5 (117842)
9 Stroke patient/ (5254)
10 1 or 7 or 8 or 9 (148875)
11 ((inpatient adj3 care) or unit* or ward*).tw. (749442)
12 10 and 11 (10374)
13 Stroke unit/ (1086)
14 ((stroke adj3 unit*) or (stroke adj3 ward*) or (stroke adj3 team*) or inpatient stroke care or inpatient stroke management).tw. (3306)
15 or/12-14 (10800)
16 Clinical trial/ (820810)
17 Randomized controlled trial/ (292216)
18 Randomization/ (54949)
19 Single blind procedure/ (14402)
20 Double blind procedure/ (101570)
21 Crossover procedure/ (31137)
22 Placebo/ (187119)
23 Randomi?ed controlled trial$.tw. (66039)
24 Rct.tw. (7970)
25 Random allocation.tw. (1064)
26 Randomly allocated.tw. (15769)
27 Allocated randomly.tw. (1715)
28 (allocated adj2 random).tw. (688)
29 Single blind$.tw. (11198)
30 Double blind$.tw. (118974)
31 ((treble or triple) adj blind$).tw. (249)
32 Placebo$.tw. (161172)
33 Prospective study/ (176077)
34 or/16-33 (1154917)
35 Case study/ (13740)
36 Case report.tw. (209839)
37 Abstract report/ or letter/ (798669)
38 or/35-37 (1018157)
39 34 not 38 (1121429)

40 15 and 39 (2586)
41 limit 40 to ((dutch or english or french or german) and yr="2000 - Current") (2171)
42 "evaluation and follow up"/ (1810)
43 clinical assessment/ (41868)
44 clinical evaluation/ (25282)
45 course evaluation/ (1143)
46 outcome assessment/ (142615)
47 health care quality/ (151801)
48 clinical indicator/ (722)
49 performance measurement system/ (1825)
50 professional standard/ (20472)
51 quality of nursing care/ (94)
52 quality circle/ (41)
53 total quality management/ (14607)
54 quality control/ (95302)
55 ((Performance or clinical or Quality) adj (indicator* or criteria or stand* or measure*)).tw. (39412)
56 limit 40 to ((dutch or english or french or german) and yr="2006 - Current") (1401)
57 or/42-55 (490162)
58 57 not 38 (466159)
59 58 and 15 (1163)
60 limit 59 to ((dutch or english or french or german) and yr="2000 - Current") (1057)

Cochrane Central Register of Controlled Trials (Date of search: 17/11/2011)

ID	Search	Hits
#1	MeSH descriptor Stroke explode all trees	3785
#2	(stroke* or apoplexy or cerebrovascular accident* or brain vascular accident* or cvas or cva or cerebral vascular accident*):ti,ab	15329
#3	MeSH descriptor Ischemic Attack, Transient, this term only	458
#4	(transient brainstem isch?emia* or transient cerebral isch?emia* or transient isch?emic attack* or tia or tias):ti,ab	523
#5	MeSH descriptor Cerebrovascular Disorders explode all trees	7541
#6	(#3 OR #4)	810
#7	(#2 AND #6)	573
#8	(#2 AND #5)	4303
#9	(#1 OR #7 OR #8)	5167
#10	MeSH descriptor Hospital Units explode all trees	2391
#11	MeSH descriptor Hospitals, Special, this term only	40
#12	MeSH descriptor Hospital Departments, this term only	49
#13	MeSH descriptor Intensive Care, this term only	723
#14	((inpatient adj3 care) or unit* or ward*):ti,ab	25548
#15	(#10 OR #11 OR #12 OR #13 OR #14)	26859
#16	(#9 AND #15)	425
#17	((stroke adj3 unit*) or (stroke adj3 ward*) or (stroke adj3 team*) or inpatient stroke care or inpatient stroke management):ti,ab	68
#18	(#16 OR #17)	470
#19	(#16 OR #17), clinical trials	437
#20	(#16 OR #17), from 2006 to 2011	149

2. QUALITY APPRAISAL: STUDIES ON THE EFFICACY OF STROKE UNITS

SIGN checklist

- Criteria of a well conducted RCT:

1.1 The study addresses an appropriate and clearly focused question.

1.2 The assignment of subjects to treatment groups is randomised*

1.3 An adequate concealment method is used*

1.4 Subjects and investigators are kept 'blind' about treatment allocation*

1.5 The treatment and control groups are similar at the start of the trial

1.6 The only difference between groups is the treatment under investigation

1.7 All relevant outcomes are measured in a standard, valid and reliable way

1.8 What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?

1.9 All the subjects are analyzed in the groups to which they were randomly allocated (often referred to as intention to treat analysis)

1.10 Where the study is carried out at more than one site, results are comparable for all sites

- Overall assessment of the study:

2.1 How well was the study done to minimize bias? (Code ++, +, or–)

2.2 Taking into account clinical considerations, your evaluation of the methodology used and the statistical power of the study, are you certain that the overall effect is due to the study intervention?

2.3 Are the results of this study directly applicable to the patient group targeted by this guideline?

2.4 Notes. Summarize the author's conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question.

- Answers :

WellC: well covered

AA: Adequately addressed

PA: Poorly addressed

NA: not addressed (i.e. not mentioned, or indicates that this aspect of study design was ignored)

NR: not reported (i.e. mentioned, but insufficient detail to allow assessment to be made)

N/A: not applicable

(*Not applicable to controlled clinical trial. Also a controlled clinical trial cannot be rated higher than 1+.)

Quality appraisal of included studies

2pt	1.1	1.2*	1.3*	1.4*	1.5	1.6	1.7	1.8	1.9	1.10	2.1	2.2	2.3	Note
Askim et al, 2006	WellC	NR	PA	AA	AA	PA	WellC	ESUS:26% (8 deaths) OSUS: 26% (4 deaths, 2 withdrawals, 2 lost to follow-up)	N/A	N/A	+	Yes	Yes	
Askim et al, 2010	WellC	AA	NR	AA	AA	AA	AA	IMT: 6.7% (1 died, 1 had serious illness because of bilateral leg amputation) ST: 0%	WellC	N/A	+	Yes	Yes	
Bernhardt et al, 2008	WellC	AA	PA	AA	AA	AA	WellC	VEM: 34.2% (11 deaths, 2 withdrawals) SC: 18.2% (6 deaths)	AA	NA	+	Yes	Yes	
Cumming et al, 2011	WellC	AA	PA	AA	AA	AA	AA	VEM: 34.2% (11 deaths, 2 withdrawals) SC: 18.2% (6 deaths)	WellC	NA	+	Yes	Yes	
Fjeartoft et al, 2011	WellC	NR	NR	AA	AA	PA	AA	ESD: 47.5% (71 deaths, 5 drop-outs) OSUS: 53.8% (77 deaths, 9 drop-outs)	WellC	N/A	+	No	Yes	
Langhorne et al, 2010	WellC	AA	AA	AA	AA	AA	AA	EM: 0% Control EM: 6% (1 death) AM: 6% (1 death) Control AM: 0%	WellC	NA	++	No	Yes	
Middleton et al, 2011	WellC	AA	AA	WellC	AA	AA	WellC	FeSS: 10.9% (59 lost to follow-up, 9 withdrew consent) excl. 20 dead Control: 9.8% (37 lost to follow-up, 12 withdrew consent)	AA	NR	++	Yes	Yes	

2pt	1.1	1.2*	1.3*	1.4*	1.5	1.6	1.7	1.8	1.9	1.10	2.1	2.2	2.3	Note
								excl. 24 dead						
Stavem and Rønning 2007	WellC	N/A	N/A	N/A	AA	PA	AA	SU: 38.6% (13 deaths, 48 lost to follow-up) GMW: 33.5% (16 deaths, 40 lost to follow-up)	PA	N/A	-	No	Yes	
Akershus Rønning and Guldvog 1998	WellC	N/A	N/A	N/A	AA	AA	PA	SU: 22.5% (61 deaths) GMW: 25.1% (70 deaths)	AA	N/A	-	Yes	Yes	60+ patients
Beijing Ma et al 2004	AA	NR	NA	NA	AA	PA	PA	NA	NA	N/A	-	No	Yes	
Edinburgh Garraway et al 1980	WellC	NR	NA	PA	AA	PA	AA	SU: 34.8% (6 lost to follow-up, 48 deaths) GW: 39.1% (61 lost to follow-up, 55 deaths)	AA	N/A	-	No	Yes	60+ patients
Athens Vemmos 2001, Spengos 2004	WellC	NR	NA	NA	PA	PA	AA	NA	NA	N/A	-	No	Yes	First ever stroke
Perth Hankey et al 1997	PA	NR	NA	AA	AA	AA	AA	NA	NA	N/A	+	Reasonably (n = small)	Yes	First ever stroke
Goteborg-Sahlgren Fagerberg et al 2000	WellC	PA	AA	AA	AA	AA	AA	SU: 50 (30.1%) (44 deaths, 6 with uncompleted data) GW: 26 (31.3%)(19 deaths, 7 with	AA	N/A	++	Yes	Yes	70+ patients

[1] The number reported in the Cochrane review ('Organized inpatient care for stroke', Stroke Unit Trialists' Collaboration, 2009, page 18) is 10.

2pt	1.1	1.2*	1.3*	1.4*	1.5	1.6	1.7	1.8	1.9	1.10	2.1	2.2	2.3	Note
								uncompleted data)						
Groningen Sulter et al. 2003	WellC	NR	NR	AA	AA	AA	AA	SMCU: 1 death (3.7%) CSU: 7 deaths (25.9%)	AA	N/A	+	Yes	Yes	Ischemic hemiparetic stroke patients
Joinville Cabral et al 2003	AA	PA	NR	AA	AA	NR	AA	SU: 25.7% dead GW 30.7% dead 4 lost to follow-up	NA	N/A	-	Yes	Yes	
Orpington Kalra et al. 2000	WellC	AA	AA	AA	AA	AA	AA	SU: 13 dead (9%), ST: 34 dead (23%), 3 lost to FU (2%)	AA	N/A	++	Yes	Yes	Moderately severe stroke patients
Pavia Cavallini et al. 2003	WellC	N/A	N/A	N/A	AA	AA	AA	NA SU: 6 deaths (4%) CU: 8 deaths (6%)	AA	N/A	-	No	Yes	First ischemic stroke patients
Stockholm Von Arbin 1980	WellC	N/A	N/A	N/A	PA	PA	AA	SU: 49 deaths (18%) GMW: 35 deaths (16%)	AA	N/A	-	No	Yes	Stroke and 'stroke-like' patients
Trondheim Indredavik et al.	WellC	NR	AA	PA	AA	AA	AA	SU: 27 deaths (24.6%) GMW: 36 deaths (32.7%) No patients lost to follow-up	WellC	N/A	+	Yes	Yes	
Umea Strand et al. 1985	AA	N/A	N/A	N/A	PA	AA	AA	SU: 43 deaths (39%) GMW: 75 deaths (41%)	AA	N/A	-	No	Yes	

3. DATA EVIDENCE TABLES: STUDIES ON THE EFFICACY OF STROKE UNITS

Headings	Description		
I Study ID			
1. Reference	Askim et al. Does an extended stroke unit service with early supported discharge have any effect on balance or walking speed? J Rehabil Med 2006; 38: 368-374.		
II Method			
1. Study design	Randomized controlled trial with blinded assessor		
2. Source of funding/conflicts of interest	Financial support from The Norwegian Fund for Postgraduate Training in Physiotherapy and from Clinical Service, St Olav's Hospital, Trondheim University Hospital		
3. Setting	3 rural municipalities Stroke Unit at Trondheim University Hospital, Norway.		
4. Sample size	N = 62 (31 x 2) ESUS: extended service or OSUS: ordinary service		
5. Duration of the Study	Screening: 1 June 1999 to 15 June 2001 Follow-up: 52 weeks after onset		
III Patient characteristics			
1. Eligibility criteria	- Diagnosis of an acute stroke (WHO definition) - Scandinavian Stroke Scale: score > 2 and < 58 - Living at home before the stroke - Inclusion within 72 hours after admission to the stroke unit and within 7 days after the onset of symptoms - Able and willing to provide informed consent.		
2. Patient characteristics		ESUS	OSUS
	Mean age	76.9	76.3
	Male (%)	51.6%	54.8%
	Diagnosis: Non-embolic infarction	58.1%	64.5%
	Embolic infarction	16.1%	25.8%
	Haemorrhage	22.6%	9.7%
	Transient ischemic attack	3.2%	0.0%
	"No significant differences between the 2 groups for any of the baseline characteristics"		

	However "… no data on BBS or walking speed at baseline, though at 1 week follow-up there was a significantly faster walking speed and a trend toward higher BBS score in the ordinary service group.
IV Intervention(s)	
1. Intervention(s)	During the acute phase (the first 1-2 weeks) both groups received well-documented stroke unit care with focus on early mobilization combined with a standardized medical programme. The extended service (ESUS): stroke unit treatment combined with a home-based programme of follow-up care coordinated by a mobile stroke team (in close cooperation with the primary healthcare system, up to 4 weeks after discharge).
2. Comparator(s)	The ordinary service group (OSUS): combined with further inpatient rehabilitation when more long-term rehabilitation is necessary or a follow-up programme organized by the primary healthcare system.
V Results primary outcome	
1. Effect size primary outcome	ESUS / OSUS / p Berg Balance Scale (median) 1 week: 32.0 / 43.5 / 0.144 6 weeks: 46.0 / 42.0 / 0.464 26 weeks: 44.0 / 43.5 / 0.842 52 weeks: 43.0 / 45.0 / 0.440 Fast walking speed (m/s ; mean ± SD) 1 week: 0.78 ± 0.36 / 1.03 ± 0.43 / 0.043 6 weeks: 0.91 ± 0.31 / 1.06 ± 0.46 / 0.217 26 weeks: 1.02 ± 0.41 / 1.15 ± 0.53 / 0.406 52 weeks: 0.97 ± 0.41 / 1.22 ± 0.48 / 0.130
VI Results secondary and all other outcomes	
1. Effect size secondary outcome(s)	N/A
2. Effect size all other outcomes, endpoints	N/A
Authors' conclusion	The results do not conclusively indicate that early supported discharge has an effect on balance. A strong association was found between initial severe leg paresis, initial inability to walk and poor balance after one year
VII Critical appraisal of study quality	
1. GRADE quality of evidence (low/moderate/high)	Moderate
2. Dropouts	ESUS: 8 died OSUS: 4 died, 2 withdrew, 2 lost to FU

3. Results critical appraisal	- The design is a randomized controlled trial with a blinded assessor, which seem the best possible given the nature of the intervention - Small sample size. - Randomization seems not completely successful: not clear why week 1 results (i.e. before the intervention) for the two groups are so different

Headings	Description		
I Study ID			
1. Reference	Askim et al. Effects of a Community-Based Intensive Motor Training Program Combined With Early Supported Discharge After Treatment in a Comprehensive Stroke Unit A Randomized, Controlled Trial. Stroke. 2010;41:1697-1703.		
II Method			
1. Study design	Randomized controlled trial with blinded assessor		
2. Source of funding/conflicts of interest	Torunn Askim was supported through The Norwegian Fund for Postgraduate Training in Physiotherapy and from Clinical Service, St. Olavs Hospital, Trondheim University Hospital.		
3. Setting	Stroke Unit at St. Olavs Hospital, Trondheim, Norway		
4. Sample size	N=62 Intensive motor training (IMT) : 30 / Standard treatment (ST): 32		
5. Duration of the Study	Screening: April 2004 to September 2007 Follow-up: 26 weeks after stroke onset		
III Patient characteristics			
1. Eligibility criteria	Diagnosis of acute stroke according to WHO's definition Modified Rankin Scale score < 3 before admission Berg Balance Scale score < 45 points Scandinavian Stroke Scale > 14 points Scandinavian Stroke Scale leg item < 6 points or Scandinavian Stroke Scale transfer item < 12 points Mini-Mental State Examination score > 20 points Able and willing to sign informed consent		
2. Patient characteristics		IMT (n=30)	ST (n=32)
	Age, mean (SD)	75.4 (7.9)	77.6 (9.6)
	Gender, women, N (%)	19 (59.4)	14 (44.8)

	Hemorrhages, N (%)	2 (6.6)		1 (3.1)	
	N of days in SU, mean (SD)	14.4 (7.4)		14.8 (6.6)	
3. Group comparability	There were no differences between the 2 groups on any features regarding patient characteristics, except there were slightly more patients with a medical history of myocardial infarction in the IMT group and slightly more patients with diabetes in the ST group.				
IV Intervention(s)					
1. Intervention(s)	IMT (Intensive Motor Training) after discharge from CSU CSU: emphasizing early mobilization and combined with early supported discharge (ESD) service during the first 4 weeks after discharge IMT: 3 additional sessions of motor training each week for the first 4 weeks after discharge and 1 additional session every week for the next 8 weeks				
2. Comparator(s)	ST (Standard Treatment) after discharge from CSU CSU: emphasizing early mobilization and combined with ESD service during the first 4 weeks after discharge ST: Further rehabilitation was administered as inpatient rehabilitation, outpatient rehabilitation, or as rehabilitation in patients' home according patients' needs				
V Results primary outcome					
1. Effect size primary outcome	(At 26-week follow-up)	IMT (n=30)	ST (n=32)	Between-group difference,	p
	Berg Balance Scale,	mean (SD)	46.9 (10.6)	45.1 (11.6)	0.651
VI Results secondary and all other outcomes					
1. Effect size secondary outcome(s)	(At 26-week follow-up)	IMT	ST	Between-group difference,	p
		N	Mean (SD)	N Mean (SD)	
	Motor Assessment Scale	30	38.4 (9.3)	32 36.3 (10.6)	0.059
	Barthel Index	30	92.5 (9.7)	32 91.4 (16.9)	0.480
	Step test	30	7.4 (5.7)	32 5.6 (4.5)	0.185
	Stroke Impact Scale, mobility	30	81.0 (18.1)	32 79.5 (21.1)	0.723
	Stroke Impact Scale, recovery	30	66.0 (17.1)	32 63.1 (21.1)	0.338
	Maximal gait speed, m/sec	21	1.2 (0.4)	21 1.0 (0.5)	0.095
2. Effect size all other outcomes, endpoints	One patient in the IMT group experienced dizziness attributable to reduced blood pressure. Another patient in the IMT group was admitted to hospital because of a new stroke. Both patients continued the IMT program after these events. There were no serious falls in the IMT group.				
Authors' conclusion	In this randomized, controlled trial, a community-based intensive motor training program, doubling the amount of physical therapy during the first 4 weeks after discharge, did not show significant improvement of balance or any other functional outcomes.				

VII Critical appraisal of study quality	
1.GRADE quality of evidence (low/moderate/high)	Moderate
2. Dropouts	IMT: 6.7% (1 died, 1 had serious illness because of bilateral leg amputation) ST: 0%
3. Results critical appraisal	- Small sample size (N=62) - General quality of study is fine.

Headings	Description
I Study ID	
1. Reference	Bernhardt et al. A Very Early Rehabilitation Trial for Stroke (AVERT) Phase II Safety and Feasibility. Stroke. 2008;39:390-396.
II Method	
1. Study design	Randomized controlled trial with blinded outcome assessment
2. Source of funding/conflicts of interest	This trial was supported by grants from the National Heart Foundation of Australia (grant number G 04M 1571), Affinity Health, and an equipment grant from the Austin Health Medical Research Fund. Dr Bernhardt was supported by a National Health and Medical Research Council (Australia) fellowship (157305).
3. Setting	Acute stroke units at 2 large teaching hospitals in metropolitan Melbourne, Australia (Austin's Hospital and St. Vincent's Hospital)
4. Sample size	N=71 Very Early Mobilization (VEM): 38 / Standard care (SC): 33
5. Duration of the Study	Recruitment: March 2004 to February 2006 Follow-up: 12 months after onset
III Patient characteristics	
1. Eligibility criteria	> 18 years First or recurrent stroke, as defined by the World Health Organization, admitted within 24 hours of symptom onset React to verbal commands (but did not need to be fully alert) Have a systolic blood pressure between 120 and 220 mm Hg, an oxygen saturation of > 92% (with or without supplementation), a heart rate between 40 and 100 beats per minute, and a temperature < 38.5°C A pre-morbid (retrospective) modified Rankin Scale score < 3 No concurrent progressive neurologic disorder, acute coronary syndrome, severe heart failure, confirmed or suspected lower-limb fracture preventing mobilization, or requiring palliative care

2. Patient characteristics		SC (n=33)	VEM (n=38)	
	Age, mean (SD)	74.9 (9.8)	74.6 (14.6)	
	Female, n (%)	17 (53)	16 (42)	
	First stroke	26 (79)	27 (71)	
	NIHSS score			
	Mild (1-7)	15 (46)	15 (39)	
	Moderate (8-16)	11 (33)	13 (34)	
	Severe (> 16)	7 (21)	10 (26)	
3. Group comparability	Baseline characteristics were similar between the groups with no significant differences found			
IV Intervention(s)				
1. Intervention(s)	VEM (Very Early Mobilization): mobilization commenced as soon as practical after recruitment, with the goal of first mobilization within 24 hours of stroke symptom onset. VEM continued daily for the first 14 days after stroke or until discharge (whichever was sooner) and was delivered by a nurse/physiotherapist team as set out in a detailed intervention protocol. Patients also received additional interventions, with the aim of assisting patients to be upright and out of bed at least twice per day, thereby doubling the standard care "mobilization dose" previously identified.			
2. Comparator(s)	Standard care from ward therapists and nurses at ASU			
V Results primary outcome				
1. Effect size primary outcome		VEM	SC	Absolute risk difference
	# of death at 3 months (%) 28.2%, p=0.20)*	8 (21)	3 (9)	12% (95% CI: -4.3% to
	Total dose of mobilization achieved, median minutes (IQR)	167 (62 to 305)	69 (31 to 115)	p=0.003
	Median hours to 1st mobilization after symptom onset (IQR)	18.1 (12.8 to 21.5)	30.8 (23.0 to 39.9)	p<0.001
	*Post hoc analysis was performed after adjusting for the baseline imbalance in stroke severity and pre-morbid mRS scores (data not shown). There was no significant difference in deaths between the 2 groups, and the CIs were wide.			
VI Results secondary and all other outcomes				
1. Effect size secondary outcome(s)		VEM	SC	Between-group difference
	# of serious adverse events at 3 months	15	14	p=0.846
	# of deterioration within the first 7 days	8	9	p=0.78
	Excessive fatigue (Borg Perceived Exertion scale > 13)	28.6%	23.3%	p=0.75
	Length of hospital stay (median, range)	6 (1-51)	7 (1-26)	p=0.31

	- No patient on VEM had 3 consecutive drops in blood pressure > 30 mm Hg during the first 3 attempted mobilizations (safety measure, patient would transfer to SC) - No evidence of changes in usual practice in response to the presence of the trial (contamination).			
2. Effect size all other outcomes, endpoints	Good outcomes (mRS score 0-2) at 3, 6, and 12 months after stroke			
	Good outcomes (mRS 0-2)	VEM, n/N (%)	SC, n/N (%)	Absolute risk difference
	3 months	15/38 (39.5)	10/33 (30.3)	9.2% (-12.9%-31.2%)
	6 months	15/36 (41.7)	11/32 (34.4)	p=0.54 for OR=1.36
	12 months	14/36 (38.9)	8/33 (24.2)	p=0.20 for OR=0.99
Authors' conclusion	VEM of patients within 24 hours of acute stroke appears safe and feasible. There was no significant difference in the number of deaths between groups (SC, 3 of 33; VEM, 8 of 38; P=0.20).			
VII Critical appraisal of study quality				
1.GRADE quality of evidence (low/moderate/high)	Moderate			
2. Dropouts	VEM: 34.2% (11 deaths, 2 withdrawals) SC: 18.2% (6 deaths)			
3. Results critical appraisal	Phase II trial (safety and feasibility trial) with small sample size. Overall good effort to minimize bias.			

Headings	Description		
I Study ID			
1. Reference	Cumming et al. Very Early Mobilization After Stroke Fast-Tracks Return to Walking. Further Results From the Phase II AVERT Randomized Controlled Trial. Stroke. 2011;42:153-158		
II Method			
1. Study design	Randomized controlled trial with blinded outcome assessment		
2. Source of funding/conflicts of interest	This trial was supported by grants from the National Heart Foundation of Australia (grant number G 04M 1571), Affinity Health, and an equipment grant from the Austin Health Medical Research Fund. Dr Bernhardt was supported by a National Health and Medical Research Council (Australia) fellowship (157305).		
3. Setting	Acute stroke units of 2 large hospitals in Melbourne, Australia (Austin's Hospital and St. Vincent's Hospital)		
4. Sample size	N=71 Very Early Mobilization (VEM): 38 / Standard care (SC): 33		
5. Duration of the Study	Recruitment: 2004-2006 Follow-up: 12 months after stroke onset		
III Patient characteristics			
1. Eligibility criteria	> 18 years Systolic blood pressure 120 to 220 mm Hg, heart rate 40 to 100 bpm, oxygen saturation > 92%, and temperature <38.5° randomized within 24 hours of symptom onset of a first or recurrent stroke pre-morbid modified Rankin Scale (mRS)15 score ≤ 3 no deterioration within the first hour of admission to the stroke unit or direct admission to intensive care		
2. Patient characteristics		SC (n=33)	VEM (n=38)
	Age, mean (SD)	74.9 (9.8)	74.6 (14.6)
	Female	17 (53)	16 (42)
	NIHSS score		
	Mild (1-7)	15 (46)	15 (39)
	Moderate (8-16)	11 (33)	13 (34)
	Severe (> 16)	7 (21)	10 (26)
3. Group comparability	Baseline characteristics between groups were similar		
IV Intervention(s)			
1. Intervention(s)	VEM: patients began mobilizing as soon as practical after randomization, with the goal of first mobilization within 24 hours of stroke onset. Patients also received additional interventions, with the aim of assisting patients to be upright and out of bed at		

	least twice per day, thereby doubling the standard care "mobilization dose" previously identified.				
2. Comparator(s)	SC: standard care from ward therapists and nursing staff in the stroke units				
V Results primary outcome					
1. Effect size primary outcome		VEM	SC	HR (CI)	p*
	Time to walking 50 m unassisted (median days, IQR)	3.5 (1.5 to 14.0)	7.0 (2.0 to 20.0)	0.523 (0.289-0.945)	0.032
	* Adjusted Cox regression				
VI Results secondary and all other outcomes					
1. Effect size secondary outcome(s)	At 3 months	VEM	SC	Between-group difference	
	Barthel Index (median, IQR)	18.5 (2.0 to 20.0)	16.5 (9.0 to 20.0)	p=0.713	
	% of good BI outcomes (%,n/N)	47% (17/36)	28% (9/32)	p=0.13	
	Rivermead Motor Assessment (median, IQR)	10.0 (0.5 to 11.0)	10.0 (3.0 to 11.0)	p=0.883	
	% of good RMA outcomes (%, n/N)	62% (23/37)	56% (18/32)	p=0.633	
	At 12 months				
	Barthel Index (median, IQR)	18.0 (0.0 to 20.0)	18.0 (7.0 to 20.0)	p=NS	
	% of good BI outcomes (%)	39%	39%	p=NS	
	Rivermead Motor Assessment (median, IQR)	10.0 (0.0 to 11.0)	9.0 (1.0 to 11.0)	p=NS	
	% of good RMA outcomes (%, n/N)	53%	45%	p=NS	
2. Effect size all other outcomes, endpoints	N/A				
Authors' conclusion	Earlier and more intensive mobilizations after stroke may fast-track return to unassisted walking and improve functional recovery.				
VII Critical appraisal of study quality					
1.GRADE quality of evidence (low/moderate/high)	Moderate				
2. Dropouts	VEM: 34.2% (11 deaths, 2 withdrawals)				
	SC: 18.2% (6 deaths)				
3. Results critical appraisal	As a Phase II trial, this study was not powered to detect differences in physical outcomes reported in this article, although an important part of feasibility testing includes evaluation of performance and utility of the outcome measures used.				

Headings	Description		
I Study ID			
1. Reference	Fjærtoft et al. Stroke Unit Care Combined With Early Supported Discharge Improves 5-Year Outcome: A Randomized Controlled Trial. Stroke. 2011;42:1707-1711.		
II Method			
1. Study design	5-year follow-up of a randomized controlled trial with blinded outcome assessment		
2. Source of funding/conflicts of interest	This publication has been financed by the Stroke Unit, St. Olavs Hospital, Trondheim University Hospital, Trondheim, Norway.		
3. Setting	Stroke Unit at St. Olav University Hospital of Trondheim, Norway		
4. Sample size	N=320 Early supported discharge (ESD): 160 / Ordinary stroke unit service (OSUS): 160		
5. Duration of the Study	Recruitment: 1995-1997 Follow-up: 5 years after stroke		
III Patient characteristics			
1. Eligibility criteria	Inclusion criteria (Source: Indredavik, et al. Stroke 2000, 31:2989-2994) Signs and symptoms of an acute stroke according to the World Health Organization definition of stroke Scandinavian Stroke Scale (SSS) score between 2 and 57 points living at home before the stroke included within 72 hours after admission to the stroke unit and within 7 days after the onset of symptoms lack of participation in other trials provision of informed consent		
2. Patient characteristics		ESD (n=160)	OSUS (n=160)
	Age, years (mean/median)	74.0/74.5	73.8/74.0
	Male (%)	54	44
	Living alone (%)	41	43
	Functional state		
	SSS (mean/median)	43.6/48.0	43.2/47.0
	BI (mean/median)	60.4/65.0	58.5/60.0
	RS (mean/median)	3.3/4.0	3.4/4.0
3. Group comparability	No significant differences existed concerning age, sex, living conditions, or comorbidities.		
IV Intervention(s)			
1. Intervention(s)	ESD (early supported discharge): organized by a coordinating mobile team that followed-up the patient for the first month after		

	discharge from the hospital. The mobile team consisted of a physiotherapist, an occupational therapist, a nurse, and the part-time service of a physician. One of the therapists acted as a case manager for the patient.
2. Comparator(s)	OSUS (ordinary stroke unit service): after discharge from the stroke unit, follow-up was organized by the primary health care service with further inpatient or outpatient rehabilitation on discharge.

V Results primary outcome

1. Effect size primary outcome

	ESD (n=155)		OSUS (n=151)		
	N	%	N	%	p
Dead	71	45.8	77	51.0	0.364
At home	72	46.5	52	34.4	0.032
In institution	12	7.7	22	14.6	0.057
mRS ≤ 2	54	34.8	43	28.5	0.213
Improvement in mRS* from onset to 5 y	58	37.5	45	29.8	0.106
Improvement in mRS* from 1 to 5 y	24	15.5	13	8.6	0.048

(*Improvement in mRS score of 1 step or more.)

VI Results secondary and all other outcomes

1. Effect size secondary outcome(s)

	ESD (n=84)	OSUS (n=74)	p
SSS			0.346
Mean (SD)	51.9 (10.7)	51.4 (8.7)	
Median (range)	57.0 (50)	55.0 (32)	
FAI			0.256
Mean (SD)	33.5 (11.3)	31.3 (12.2)	
Median (range)	33.0 (38)	32.0 (39)	
MMSE			0.458
Mean (SD)	25.9 (4.8)	25.0 (5.9)	
Median (range)	27.5 (25)	27.0 (24)	
SSS ≥ 52, n (%)	62 (73.8)	50 (67.6)	0.389
BI ≥ 95, n (%)	48 (57.1)	38 (51.4)	0.285
Length of hospital stay (mean)	18.6	31.1	0.0324

(BI indicates Barthel Index; ESD, early supported discharge; FAI, Frenchay Activity Index; MMSE, Mini Mental Status Examination; OSUS, ordinary stroke unit service; SD, standard deviation; SSS, Scandinavian Stroke scale)

2. Effect size all other outcomes, endpoints	N/A
Authors' conclusion	Stroke unit care combined with ESD seems to reduce death and institutional care and to improve patients' chances of living at home 5 years after stroke compared to traditional stroke care. There is a trend toward improved functional outcome in the

	ESD group.
VII Critical appraisal of study quality	
1.GRADE quality of evidence (low/moderate/high)	Moderate
2. Dropouts	ESD: 47.5% (71 deaths, 5 drop-outs) OSUS: 53.8% (77 deaths, 9 drop-outs)
3. Results critical appraisal	5-year follow-up of a RCT. No description on methods of randomization and concealment on allocation in the original trial (Indredavik 2000).

Headings	Description				
I Study ID					
1. Reference	Langhorne et al. Very Early Rehabilitation or Intensive Telemetry after Stroke: A Pilot Randomised Trial. Cerebrovasc Dis 2010;29:352–360.				
II Method					
1. Study design	Observer-blinded, factorial (2×2) randomized controlled trial				
2. Source of funding/conflicts of interest	Chest, Heart and Stroke Scotland provided financial support and Welch Allyn Inc. monitoring equipment. Neither funder had any involvement in the planning, conduct or reporting of the trial.				
3. Setting	Not addressed				
4. Sample size	N=32 (4x8)				
5. Duration of the Study	Recruitment: February 2007-January 2008 Follow-up: 3 months				
III Patient characteristics					
1. Eligibility criteria	Patients with a diagnosis of stroke (either ischemic or haemorrhagic) were identified in the hospital emergency admissions unit within 24 h of admission. The exclusion criteria were severe pre-stroke disability (that would prevent mobilization), full recovery and severe co-morbidities requiring close medical monitoring.				
2. Patient characteristics		EM	Control EM	AM	Control AM
		(n = 16)	(n = 16)	(n = 16)	(n = 16)
	Age, years	64 (60–72)	71 (53–76)	64 (51–75)	70 (62–75)
	Male	10	6	6	10
	Living alone	7	10	9	8

	Pre-stroke Rankin 0–1	15	13	14	14
	Time from symptom onset to randomisation, h	27.0 (24.5–29.8)	26.1 (18.8–29.4)	27.0 (24.5–29.8)	25.6 (18.8–29.4)
3. Group comparability	Some baseline imbalances were apparent, although none were statistically significant.				
IV Intervention(s)					
1. Intervention(s)	EM (early mobilization): standard care plus a protocol of EM based on the AVERT trial. The research nurse had a role ensuring the EM protocol was implemented in conjunction with physiotherapy staff, during the first week after recruitment. This aimed to get patients up to sit, stand and walk within 24 h of the stroke and continue this at least 4 times per day. AM (automated monitoring): standard care plus a protocol-driven approach to continuous monitoring. We used an established commercial system (Welch Allyn Inc.) which included ambulatory monitoring. The protocol comprised advice on responding to abnormalities of heart rate or rhythm, blood pressure, temperature, oxygen saturation or blood glucose. Routine monitoring continued for the first 3 days and could be extended to 7 days if physiological variables were unstable. After that the patients reverted to standard care. Combined protocol: this incorporated both EM and AM				
2. Comparator(s)	Conventional SU: an established multidisciplinary stroke unit. This unit had a philosophy of getting patients up to sit, stand and walk from the day of admission. Monitoring involved intermittent (4-hourly) checking of pulse, temperature, oxygen saturation and blood pressure. Mobilization was provided by physiotherapists (30–60 min per day) and nurses.				
V Results primary outcome					

1. Effect size primary outcome	Three-month outcomes	EM (n = 16)	Control EM (n = 16)	Significance p	AM (n = 16)	Control AM (n = 16)	Significance p
	Rankin Score						
	Independent (0–2)	12	7	0.07	10	9	0.72
	Dependent (3–5)	4	8		5	7	
	Dead	0	1		1	0	
VI Results secondary and all other outcomes							

1. Effect size secondary outcome(s)	p Mobilization	EM (n = 16)	Control EM (n = 16)	Significance p	AM (n = 16)	Control AM (n = 16)	Significance p
	Time from symptom onset to first mobilization, h	27.3 (26.0–29.0)	32.0 (22.5–47.3)	0.31	28.3 (26.0–34.5)	27.3 (21.3–32.5)	0.22

Time from randomization to first mobilization, h	0 (0–3)	4 (1–18)	0.02	1 (0–7)	1 (0–6)	0.72
Mobilized within 1 h of randomization	12	6	0.03	8	10	0.45
Walking within 1 h of randomization	8	2	0.007	4	6	0.51
Achieved walking in first 72 h	13	3	0.01	9	11	0.47
Achieved standing/ walking on automatic activity monitor	14	8	0.02	10	12	0.45
Achieved walking in first 5 days	13	7	0.03	9	11	0.47
Abnormal physiological events in first 72h (BP, tachy/bradycardia, pyrexia, hyperglycemia, hypoxia)						
Total number of abnormal events	10 (4–12)	9 (6–12)	0.93	12 (10–13)	5 (2–9)	<0.001
> 10 abnormal events	8	7	0.72	12	3	0.001
Day 5 outcomes						
Complications (between days 0 and 5)						
None	11	6	0.02	7	10	0.73
Chest infection	2	7		6	3	
Other complications of immobility (DVT, urinary tract infection)	0	3		1	2	
Other (falls, fatigue)	3	0		2	1	
Stroke progression	3	7	0.13	5	5	1.00
mNIH total score	3 (1–8)	6 (3–10)	0.22	5 (1–17)	4 (2–7)	0.45
Barthel Index	18 (11–18)	10 (3–20)	0.59	12 (1–18)	17 (11–18)	0.31
Borg Exertion Scale day 5	13 (9–15)	15 (11–20)	0.25	15 (11–20)	13 (11–15)	0.28
Rivermead Mobility Index	7 (5–9)	5 (1–8)	0.09	4 (1–9)	6 (5-8)	0.62

	Discharge destination from acute hospital						
	Home	13	10	0.20	9	14	0.38
	Rehabilitation	3	5		6	2	
	Dead	0	1		1	0	

2. Effect size all other outcomes, endpoints	Three-month outcomes	EM (n = 16)	Control EM (n = 16)	Significance p	AM (n = 16)	Control AM (n = 16)	Significance p
	Barthel Index						
	Independent (18–20)	12	7	0.07	10	9	0.72
	Dependent (0–17)	4	8		5	7	
	Dead	0	1		1	0	
	Total score	20 (18–20)	17 (2–20)	0.21	19 (8–20)	19 (16–20)	0.78
	Complications (between days 5 and 90)						
	None	8	7	0.99	4	11	0.22
	Chest infection	1	1		2	0	
	Other complications of immobility	3	2		5	1	
	Other	4	5		5	4	
	Resource use during first 3 months						
	Length of initial hospital stay	10 (5–14)	12 (6–16)	0.49	11 (6–19)	10 (5–13)	10
	Readmitted to hospital	0	5	0.01	3	2	0.62
	Home help visited	3	3	1.00	1	5	0.28
	District nurse visited	0	0	1.00	0	0	1.00
	GP visited	12	7	0.38	9	10	0.27
	Physiotherapist visited	4	7	0.25	6	5	0.33
	OT visited	4	6	0.28	5	5	1.00
	Carer visited	4	7	0.20	6	5	0.25
	Other visited	3	2	0.27	4	1	0.41
	Total readmission days	0 (0–0)	0 (0–1)	0.10	0 (0–1)	0 (0–0)	0.61

Authors' conclusion	We have demonstrated the feasibility of implementing EM and AM for physiological complications in a randomised controlled trial. Larger trials are warranted to determine whether these interventions have clinical benefits.
VII Critical appraisal of study quality	

1.GRADE quality of evidence (low/moderate/high)	High
2. Dropouts	EM: 0% Control EM: 6% (1 death) AM: 6% (1 death; same person as above) Control AM: 0%
3. Results critical appraisal	Very small sample size Evaluation of two interventions in one small trial (factorial design)

Headings	Description		
I Study ID			
1. Reference	Middleton et al. Implementation of evidence-based treatment protocols to manage fever, hyperglycaemia, and swallowing dysfunction in acute stroke (QASC): a cluster randomised controlled trial. Lancet 2011; 378: 1699–706.		
II Method			
1. Study design	Single-blind cluster randomised controlled trial		
2. Source of funding/conflicts of interest	National Health & Medical Research Council ID 353803, St Vincent's Clinic Foundation, the Curran Foundation, Australian Diabetes Society-Servier, the College of Nursing, and Australian Catholic University		
3. Setting	19 ASUs located in large, tertiary referral centers in New South Wales, Australia		
4. Sample size	N=1126 Fever, Sugar, Swallowing (FeSS):626 / Control: 500		
5. Duration of the Study	Intervention: May 15, 2007 to August 25, 2010 Follow-up: 3 months after hospital admission		
III Patient characteristics			
1. Eligibility criteria	English speaking aged 18 years or older diagnosis of ischemic stroke or intracerebral haemorrhage presented within 48 h of onset of symptoms to a participating ASU Patients were excluded if they did not have a telephone or were admitted for palliative care		
2. Patient characteristics		Control (n=500)	Intervention (n=626)
	Age group (years)		
	<65	137/498 (28%)	195/625 (31%)

	65–74	130/498 (26%)	150/625 (24%)	
	75–84	158/498 (32%)	181/625 (29%)	
	≥85	73/498 (15%)	99/625 (16%)	
	Sex			
	Male	298/500 (60%)	376/626 (60%)	
	Female	202/500 (40%)	250/626 (40%)	
	Los Angeles Motor Scale			
	0 (mild stroke)	203/493 (41%)	262/622 (42%)	
	≥1 (more severe stroke)	290/493 (59%)	360/622 (58%)	
3. Group comparability	The length of time ASUs had been established before trial commencement was similar between intervention and control groups. Age, sex, 90-day death, 90-day death and dependency, 90-day functional dependency (BI), and health status (PCS score and MCS score) were similar for the intervention and control groups.			
IV Intervention(s)				
1. Intervention(s)	FeSS (Fever, Sugar, Swallowing): Intervention ASUs received an evidence-based treatment protocol for the multidisciplinary management of fever, hyperglycaemia, and swallowing dysfunction for the first 72 h after admission. It targeted all ASU clinicians, focusing on barrier identification, reinforcement of multidisciplinary teamwork, local adaptation, and use of site champions.			
2. Comparator(s)	Conventional ASU: Control ASUs received only an abridged version of existing guidelines			
V Results primary outcome				
1. Effect size primary outcome	90 days after hospital admission	Control (n=451)	Intervention (n=558)	p value
	Death and dependency (mRS ≥2) (ICC 0 .018)	259/449 (58%)	236/558 (42%)	0.002
	Barthel index ≥95 (ICC 0.015)	254/423 (60%)	367/532 (69%)	0.07
	Barthel index ≥60 (ICC 0.009)	380/423 (90%)	487/532 (92%)	0.44
	SF-36 Physical health (PCS score) (ICC 0.026)	42.5 (10.5)	45.6 (10.2)	0.002
	SF-36 Mental health (MCS score) (ICC 0.011)	49.4 (10.6)	49.5 (10.9)	0.69
VI Results secondary and all other outcomes				
1. Effect size secondary outcome(s)		Control (n=451)	Intervention (n=558)	p value
	Fever			
	Mean temperature during first 72 h in ASU (°C, ICC 0.084)	36.6 (0.30)	36.5 (0.27)	0.001

	At least one temperature ≥37.5°C in first 72 h (ICC 0.009)	131 (27%)	105 (17%)	<0.0001
	Glucose			
	Mean glucose during first 72 h in ASU (mmol/L; ICC 0.056)	7.0 (2.0)	6.8 (1.8)	0.02
	Swallowing screening			
	Swallowing screening within 24 h of admission to ASU (ICC 0.156)	24/350 (7%)	242/522 (46%)	<0.0001
	Length of hospital stay (days)	13.7 (12.7)	11.3 (10.3)	0.144
2. Effect size all other outcomes, endpoints	N/A			
Authors' conclusion	Our trial provides compelling evidence that better management of fever, hyperglycaemia, and swallowing in acute stroke patients during the initial 72 h of admission to an ASU can result in decreased rates of death, dependency, and improved processes of care.			
VII Critical appraisal of study quality				
1.GRADE quality of evidence (low/moderate/high)	High			
2. Dropouts	FeSS: 10.9% (59 lost to follow-up, 9 withdrew consent), excluding 20 patients that died before day 90 Control: 9.8% (37 lost to follow-up, 12 withdrew consent), excluding 24 patients that died before day 90			
3. Results critical appraisal	Good on blinding and sample size. Randomization by ASU, not by patient might involve confounding factors. Treatment after 72 hours was not standardized across participating centers. Outcomes have been adjusted for pre-intervention data and clustering.			

Headings	Description						
I Study ID							
1. Reference	Stavem and Rønning. Quality of Life 6 Months after Acute Stroke: Impact of Initial Treatment in a Stroke Unit and General Medical Wards. Cerebrovasc Dis 2007;23:417–423.						
II Method							
1. Study design	Controlled clinical trial						
2. Source of funding/conflicts of interest	Not declared						
3. Setting	Akershus University Hospital, Lørenskog, Norway						
4. Sample size	N=325 Stroke Unit (SU): 158 / General Medical Ward (GMW): 167						
5. Duration of the Study	Recruitment: March 1, 1994-December 31, 1995 Follow-up: 6 months						
III Patient characteristics							
1. Eligibility criteria	≥ 60 years hospitalized within 24 h of onset of stroke, as defined according to WHO criteria patients with intracerebral hemorrhage and prior stroke were included patients living in nursing homes were included patients with primary subarachnoid haemorrhage or subdural haematoma were excluded						
2. Patient characteristics		Respondents	Non-respondents	p	Respondents in SU	Respondents in GMW	p
	Patients	208	88		97	111	
	Age in years, mean ± SD	73.8±6.4	76.9±6.6	0.0002	73.7±6.5	73.9±6.3	0.88
	Female sex, n (%)	87 (42)	48 (55)	0.05	38 (39)	49 (44)	0.47
	Living alone, n (%)	58 (28)	32 (36)	0.15	26 (27)	32 (29)	0.29
	Haemorrhagic stroke	18 (9)	5 (6)	0.38	12 (12)	6 (5)	0.08
	SSS day 5, mean ± SD	50.3±7.9	47.8±10.7	0.02	50.4±7.9	50.3±8.0	0.91
	Barthel index day 5, mean ± SD	78.8±25.0	67.4±32.7	0.001	77.0±26.5	80.3±23.7	0.34
	Had late rehabilitation, n (%)	58 (28)	14 (16)	0.03	30 (31)	28 (25)	0.36

3. Group comparability	The allocation procedure produced two well-balanced groups.					
IV Intervention(s)						
1. Intervention(s)	Acute SU: multidisciplinary organized in-hospital treatment. The acute SU used a systematic approach with a protocol for investigations, early medical treatment and rehabilitation. The mean length of stay was 10 days in the SU.					
2. Comparator(s)	GMW (general medical ward): conventional good medical treatment without special focus on early rehabilitation or a multidisciplinary approach. The mean length of stay was 8 days in the GMWs.					
V Results primary outcome						
1. Effect size primary outcome		SU		GMW		p
		N	mean ±SD	n	mean ±SD	
	SF-36 scale (range 0–100)					
	Physical functioning	97	57.8±33.8	111	54.1±35.7	0.44
	Role limitation, physical	95	54.7±41.3	110	60.9±37.0	0.26
	Bodily pain	96	70.2±28.8	111	68.8±29.7	0.74
	General health	94	56.6±21.6	110	58.1±20.3	0.62
	Vitality	96	53.3±17.8	111	49.5±18.5	0.13
	Social functioning	94	83.9±21.2	110	82.4±22.1	0.62
	Role limitation, emotional	96	89.2±28.8	108	87.7±29.4	0.70
	Mental health	96	71.8±15.3	111	70.3±14.8	0.46
	Physical component summary scale	94	39.7±11.9	105	39.7±11.4	0.99
	Mental component summary scale	94	53.3±8.7	105	52.5±8.1	0.53
VI Results secondary and all other outcomes						
1. Effect size secondary outcome(s)		SU		GMW		p
		n	mean ±SD	n	mean ±SD	
	SSS (range 0–58)	129	53.6±6.8	139	54.1±5.7	0.52
	Barthel index (range 0–100)	129	89.7±19.4	139	92.6±15.5	0.18
2. Effect size all other outcomes, endpoints	N/A					
Authors' conclusion	An acute SU with a short length of stay, offering early treatment and rehabilitation, could not show an improvement in the HRQoL of stroke					

	patients ≥ 60 years 6 months after stroke compared with initial treatment in GMWs.
VII Critical appraisal of study quality	
1.GRADE quality of evidence (low/moderate/high)	Low
2. Dropouts	SU: 38.6% (13 deaths, 48 lost to follow-up) GMW: 33.5% (16 deaths, 40 lost to follow-up)
3. Results critical appraisal	Controlled clinical trial. Allocation based on date of birth. Analysis based on respondents only (excluding dead patients, debilitated patients etc.) thus results may be biased.

Headings	Description			
I Study ID	Akershus			
1. Reference	Rønning and Guldvog. Stroke Unit Versus General Medical Wards, II: Neurological Deficits and Activities of Daily Living. A Quasi-Randomized Controlled Trial. Stroke. 1998;29:586-590.			
II Method				
1. Study design	Controlled clinical trial			
2. Source of funding/conflicts of interest	This study was supported by grants from the National Association for Heart and Vascular Diseases.			
3. Setting	Central Hospital of Akershus, Nordbyhagen, Norway			
4. Sample size	N=550 Stroke Unit (SU): 271 / General Medical Ward (GMW): 279			
5. Duration of the Study	Recruitment: March 1, 1994-December 31, 1995 Follow-up: 7 months			
III Patient characteristics				
1. Eligibility criteria	aged 60 years or older admitted to the hospital within 24 hours of onset of symptoms of a stroke, as defined according to World Health Organization criteria patients with intracerebral hemorrhage, prior stroke(s), or cognitive deficits and those living in nursing homes were not excluded Patients with primary subarachnoid hemorrhage or subdural hematoma were excluded from the study			
2. Patient characteristics		SU (n=271)	GMW (n=279)	P
	Mean age, y (SD)	76.8 (7.4)	76.1 (7.0)	0.62

	Mean age of men, y (SD)	75.1 (7.1)	74.9 (7.0)	0.85
	Mean age of women, y (SD)	78.7 (8.3)	77.5 (6.7)	0.20
	Female sex	127 (46.9%)	131 (47.0%)	0.98
	Living alone	92 (33.9%)	100 (35.8%)	0.53
	Nursing home	6 (2.2%)	10 (3.6%)	0.48
	SSS	41 (22–49)	44 (26–52)	0.22
	BI	45 (10–80)	50 (2.5–85)	0.54
3. Group comparability	No significant difference between two groups			
IV Intervention(s)				
1. Intervention(s)	SU: 10 beds. Mean length of inpatient stay: 9.5 days (SD: 6.9) Protocol: a standard examination was performed including neurological assessment, blood tests, ECG, and a CT of the brain within 2 hours after admittance. If an ischemic stroke was suspected after clinical and CT evaluation, 160 mg of aspirin per os was immediately administered. As early as possible, the patient was mobilized, often within the first hours after admittance to the hospital. The routine of mobilization of patients with hemorrhages was the same as for those with ischemic strokes. Patients with paralysis and patients who were impossible to mobilize because of inability to cooperate were given subcutaneous low-molecular-weight heparin to prevent thromboembolic complications. Parenteral iso-osmolar fluid was administered routinely the first 24 hours. Hyperglycemia was treated with insulin when serum glucose was ≥12 mmol/L. Fever was treated with antipyretics(acetaminophen, 500-mg tablet) when temperature was ≥ 38°C.Antihypertensive treatment was not initiated the first week except for markedly elevated blood pressure. If the patient used antihypertensive medication, this medication was most often continued. If cardioembolic stroke was suspected, a cardiologist was consulted and eventually anticoagulation was initiated as secondary prophylaxis. Anticoagulation was not given as an acute treatment. The staff was multidisciplinary, with neurologists, trained nurses, physiotherapists, an occupational therapist, and a speech therapist. A stroke team met weekly for evaluation of progress and to plan further treatment for each patient. The nurses were specially trained to detect and avoid complications. Special forms were constructed to discover changes early. The physiotherapists followed the Bobath technique and instructed the staff to follow this approach for 24 hours. A multidisciplinary team met with the relatives weekly to plan treatment and care after discharge.			
2. Comparator(s)	GMW (general medical ward): traditional, good medical treatment without special efforts or standardized effort toward this patient group. Mean length of inpatient stay: 7.7 days (SD: 6.2) Protocol: a CT scan was requested but not routinely as an emergency examination. Patients were immobilized until hemorrhage was excluded by CT scan. Patients with ischemic strokes were then mobilized, while patients with hemorrhages were often immobilized for 1 week. Aspirin was given if the CT scan did not reveal a hemorrhage. Prophylactic administration of low-molecular-weight heparin was given to prevent venous thrombosis for immobilized patients. There was no routine of giving antipyretics or parenteral iso-osmolar fluids, as in the SU. Anticoagulation was started when a possible cardiogenic			

	embolic source was detected. Patients were offered physiotherapy, occupational therapy, and evaluation of a neurologist when the staff requested it.			
V Results primary outcome				
1. Effect size primary outcome		SU	GMW	OR (95% CI)
		(n=271)	(n=279)	
	Death	61 (22.5%)	70 (25.1%)	0.87 (0.59–1.28)
	Need of long-term care	40 (14.8%)	43 (15.4%)	0.95 (0.60–1.52)
	Survived and improved	157 (64.6%)*	154 (60.6%)†	1.12 (0.80–1.57)
	Survived but did not improve	13 (5.3%)*	12 (4.7%)†	1.12 (0.50–2.50)
	Deteriorated	12 (4.9%)*	19 (7.5%)†	0.63 (0.30–1.33)
	Deteriorated or died	73 (30.0%)*	89 (35.0%)†	0.79 (0.55–1.14)
	Data are expressed as number of patients with/without a given characteristic and also in (%) and odds ratios (OR) with 95% confidence intervals (CI). *n=243. †n=254. (Patients missing are not included in the analysis of improvement/deterioration.)			
	Additional data presented in the Cochrane review ('Organized inpatient care for stroke', Stroke Unit Trialists' Collaboration 2009):			
	Death or dependency by the end of scheduled follow up	103/271	110/279	0.94 (0.67-1.33)
VI Results secondary and all other outcomes				
1. Effect size secondary outcome(s)		SU	GMW	P
	SSS day 1	46	49	
	SSS day 5	50	51	
	SSS 7 months	55	54	0.036
	BI day 1	55	60	
	BI day 5	66	68	
	BI 7 months	83	84	0.152
2. Effect size all other outcomes, endpoints	N/A			
Authors' conclusion	Our study confirms the benefit of the stroke unit, but the effects on the most reliable clinical outcomes were modest and insignificant			
VII Critical appraisal of study quality				

1.GRADE quality of evidence (low/moderate/high)	Low
2. Dropouts	SU: 22.5% (61 deaths) GMW: 25.1% (70 deaths)
3. Results critical appraisal	Controlled clinical trial. Poor randomization method. Assessment on outcomes was not really blinded.

Headings	Description
I Study ID	Beijing
1. Reference	Ma et al. Assessment of the early effectiveness of a stroke unit in comparison to the general medical ward. Chinese Medical Journal, 2004, Vol. 116 No. 6 : 852-855.
II Method	
1. Study design	Randomized controlled trial
2. Source of funding/conflicts of interest	Not declared
3. Setting	Tiantan Hospital, Beijing, China
4. Sample size	N=392 Stroke Unit (SU): 195 / General medical ward (GW): 197
5. Duration of the Study	Recruitment: December 2001-January 2003 Follow-up: until discharge
III Patient characteristics	
1. Eligibility criteria	Age ≥ 18 years patients suffered from acute focal neurological defects caused by cerebral vessel disease and lasting more than 24 hours patients were excluded in cases of intracerebral hemorrhages, epi- or sub-dural hematoma, and subarachnoid hemorrhages caused by trauma or tumors
2. Patient characteristics	Mean age: 62.34±12.55 years (95%CI, 61.09-63.58) Cerebral infarctions: 285 Cerebral hemorrhages: 107 Mean BI score: 35.33±31.61 (SU), 44.87±35.38 (GW)
3. Group comparability	There were no significant differences (P>0.05) between the two groups with regard to sex, age, marital status, degree of education, geographical distribution, ability to pay for treatment, insurance coverage, stroke subtype, time of initial treatment, or previous history of strokes.

At the time of admission, there was also no statistically significant difference between the two groups with regard to NIHSS scores (SU 9.89±7.87, GW 8.65±8.17) or OHS scores (SU 3.59±1.37, GW 3.34±1.48). The mean BI score was 35.33±31.61 for SU patients and 44.87±35.38 for GW patients. Although there were great differences in lifestyle habits between the two groups (t=-2.816, P=0.005, -16.2- -2.88, 95%CI), more careful analysis indicated that the initial stroke severity (mild, moderate, or serious) was not affected by lifestyle.

IV Intervention(s)

1. Intervention(s)

SU comprised of rehabilitation section, computer-aided speech-language pathology section, computer-aided neuropsychological section and the multimedia-aided health education section. With these four treatment sections, a SU has the ability to provide life support, medical treatment, physical rehabilitation, psychological therapy, and health education.

Protocol: If the cause of stroke was suspected to be a heart deficiency, a cardiologist was consulted and the patient was given anti-coagulation drugs. If necessary, the patient was transferred into an intensive care unit or monitored by electrocardiograph (ECG). Rehabilitation therapy was initiated soon after admission. During the early period of treatment, a rehabilitation therapist interviewed the stroke patient, evaluated the degree of disability, and scheduled the individual program of rehabilitation. Patients who were handicapped in speech and communication faculties were evaluated and trained by a special speech and language therapist. The training plan incorporated physical rehabilitation, occupational therapy, and other training programs, and took into account the opinions of the aphasic patient and his or her family. Emotional disorders related to strokes, including depression or anxiety, were common complications. The psychologists, neurologists, and special nurses all provided their own suggestions, making an effort to solve psychological problems and encourage patients' self-confidence, and actively treat the primary causes of the stroke, manage the risk factors, and assist in rehabilitation. In clinical practice, patients with mental disorders were assessed, and received psychological or medical treatment. In addition, education procedures were put into practice to ensure that the SU staff became aware of new knowledge in cerebrovascular medicine, and also to educate the public about prevention and recognition of strokes and the availability of therapy.

2. Comparator(s)

GW (general medical ward): traditional treatment

V Results primary outcome

1. Effect size primary outcome

	SU	GW	Statistical test result
Mean change Barthel index	20.00±24.36	10.63±23.59	t=3.866, P=0.000, 95%CI: 4.6-14.13
Mean change NIH Stroke Scale	-2.01±6.61	0.55±7.44	t=3.598, P=0.000, 95%CI: (-3.96)-(-1.16)
Mean change Oxford Handicap Scale	-0.74±1.04	-0.74±1.04	t=-4.441, P=0.000, 95%CI, (-0.66)-(-0.25)

Unpublished data presented in the Cochrane review (‘Organized inpatient care for stroke’, Stroke Unit Trialists’ Collaboration, 2009):

	SU	GW
Death by the end of scheduled follow up	12/195 (6.2%)	19/197 (9.6%)
Death or institutional care by the end of scheduled follow up	23/195 (11.8%)	27/197 (13.7%)

	Death or dependency by the end of scheduled follow up		113/195 (57.9%)	118/197 (59.9%)
	Length of stay (days) in a hospital or institution or both (mean, SD)		20.6 (10.4)	22.3 (19.7)
VI Results secondary and all other outcomes				
1. Effect size secondary outcome(s)		SU	GW	Statistical test result
	Patients with complications			χ2=34.843, P=0.000
	from Infections	16.9%	34.0%	χ2=14.171, P=0.000
	from mental disorders			χ2=16.732, P=0.000
	pain			χ2=6.869, P=0.006
	# of patients with neurological complications Or complications from stress ulcers (n/N, %)		49/195 (25.1%)	107/197 (54.3%)
2. Effect size all other outcomes, endpoints	N/A			
Authors' conclusion	Compared to GW patients, stroke patients treated in a special SU were able to return to normal daily activities earlier, with better social abilities, and have reduced neurological defects, without increasing the overall economic burden.			
VII Critical appraisal of study quality				
1.GRADE quality of evidence (low/moderate/high)	Low			
2. Dropouts	NA			
3. Results critical appraisal	No randomization or concealment was reported, neither on blinded assessment on endpoints. No death/dropouts reported.			

Headings	Description
I Study ID	Edinburgh
1. Reference	- Garraway et al. Management of acute stroke in the elderly: preliminary results of a controlled trial. British Medical Journal 1980. Volume 280(6220):1040-1043 - Garraway et al. Management of acute stroke in the elderly: follow-up of a controlled trial. British Medical Journal 1980. Volume 281(6244):827-829.
II Method	
1. Study design	Randomized controlled trial
2. Source of funding/conflicts of interest	Financial support was given by the Scottish Home and Health Department and Lothian Regional Council.
3. Setting	Royal Victoria Hospital, Edinburgh, UK
4. Sample size	N=311 Stroke Unit (SU): 155 / General medical ward (GW): 156
5. Duration of the Study	Recruitment: October 1975-April 1978 One year follow-up after discharge
III Patient characteristics	
1. Eligibility criteria	aged 60 years and over had stroke in according to the definition of a focal neurological deficit of presumed vascular origin stroke present for at least six hours but no longer than three days before admission patient was conscious and had an established or developing hemiplegia at the time of assessment
2. Patient characteristics	Mean age: 73 years Mean interval from the onset of stroke to admission to the study: 26 hours
3. Group comparability	There were no differences between patients in the two groups as regards age, sex, social class, marital state, whether they were living alone at home or with members of their family, activities before the stroke, and duration of stroke on admission to the study. The degree of hemiplegia present on admission was remarkably similar in the two groups
IV Intervention(s)	
1. Intervention(s)	SU: created by changing the function of a ward of 15 beds within a geriatric unit Mean inpatient stay: 55 days[2]
2. Comparator(s)	GW (general medical ward): medical units on call for emergency admissions Mean inpatient stay: 75 days3

[2] Number reported in the Cochrane review was 54.5 days (SD 42.3)

V Results primary outcome				
1. Effect size primary outcome	1-year follow-up after discharge	SU	GW	
	Independent	56	52	
	Dependent	45	39	
	% of independent patients became dependent	19% (13/67)	24% (11/45)	
	Death	48	55	
	Additional data presented in the Cochrane review ('Organized Inpatient Care for Stroke', Stroke Unit Trialists' Collaboration 2009):			
	Death or institutional care by the end of the scheduled follow up		66/155 78/156	
VI Results secondary and all other outcomes				
1. Effect size secondary outcome(s)	Outcomes at end of acute phase of rehabilitation	SU (n=155)	GW (n=152)	
	Independent (n, %)	78 (50)	49 (32)	
	Dependent (n, %)	47 (31)	60 (40)	
	Death (n, %)	30 (19)	43 (28)	
2. Effect size all other outcomes, endpoints	Use of physiotherapy (figures are means± SE)			
		SU (n=155)	GW (n=152)	Significance of differences
	No (%) of patients receiving any physiotherapy	149 (96)	134 (88)	p<0.05
	Delay in starting treatment (days)	3.0±0.3	3.8±0.2	p<0.05
	Duration of treatment (days)	49.3±3.3	70.5±7.8	p<0.05
	No of hours of treatment	21.0±1.5	36.4±4.0	p<0.001
Authors' conclusion	Results of this trial show that the stroke unit improved the natural history of stroke by increasing the proportion ofpatients who were returned to functional independence.			
VII Critical appraisal of study quality				
1.GRADE quality of evidence (low/moderate/high)	Low			
2. Dropouts	SU: 34.8% (6 lost to follow-up, 48 deaths) GW: 39.1% (64 lost to follow-up, 55 deaths)			
3. Results critical appraisal	Insufficient description of methods of randomization and concealed allocation. Endpoint assessment was not blinded.			

[3] Number reported in the Cochrane review was 75.1 days (SD 92.5)

[4] The number reported in the Cochrane review ('Organized inpatient care for stroke', Stroke Unit Trialists' Collaboration, 2009, page 18) is 10.

Headings	Description		
I Study ID	Athens		
1. Reference	- Spengos K, Tsivgoulis G, Manios E, Papamichael C, Konstastinopoulou A, Vemmos K. Which patients benefit most from treatment in a stroke unit? Stroke 2004:294. - Vemmos K, Takis K, Madelos D, Synetos A, Volotasiou V, Tzavellas H. Stroke unit treatment versus general medical wards: long term survival. Cerebrovascular Diseases 2001;11 Suppl 4:8.		
II Method			
1. Study design	Randomized controlled trial		
2. Source of funding/conflicts of interest	Not declared		
3. Setting	University of Athens, Greece		
4. Sample size	N = 608 Acute Stroke Unit (ASU): 302 / General Medical Ward (GMW): 302		
5. Duration of the Study	3 years (1/7/1992 to 30/6/1995) Mean follow-up: 80.4 ± 15.1 months		
III Patient characteristics			
1. Eligibility criteria	- First ever stroke - Relapsed time from stroke onset to admission <24h - Excluded: TIAs , SAH, and recurrent stroke		
2. Patient characteristics		ASU	GMW
	N	302	302
	Age	70.5 ± 11.1	70.8 ± 12.5
	Scandinavian Stroke Scale (SSS)	31.53 ± 20.9	31.50 ± 21.8
3. Group comparability	There were no differences between the two groups in regard to basic characteristics, risk factors, and neurological impairment as assessed by Scandinavian Stroke Scale.		
IV Intervention(s)			
1. Intervention(s)	Management in an acute stroke unit (ASU)		
2. Comparator(s)	Management on general medical wards (GMW)		

V Results primary outcome				
1. Effect size primary outcome		ASU	GMW	p
	Mortality – 1 month	56 (18.5%)	81 (26.8%)	0.015
	Mortality – 1 year	103 (36.7%)	1215 (45.8%)	0.039
	Mortality – 5 years	163 (54.0%)	175 (57.9%)	0.015
	Mortality – Final follow-up (6½ years)	184 (60.9%)	190 (62.9%)	0.148
VI Results secondary and all other outcomes				
1. Effect size secondary outcome(s)	1 month mortality in subgroups with severe neurological deficit (0<SSS<14) and/or a mild impairment of consciousness (8<GCS<13)			
	Subgroup	ASU	GMW	p
	Glasgow Coma Scale (GCS) 8-13	19.2%	44.3%	<0.01
	Scandinavian Stroke Scale (SSS) 0-14	46.1%	68.8%	<0.01
	GCS 8-13 and SSS 0-14	22.5%	55.0%	<0.01
	Unpublished data presented in the Cochrane review Organized inpatient (stroke unit) care for stroke (Review)' (Stroke Unit Trialists' Collaboration, 2009):			
		ASU	GMW	
	Death or institutional care by the end of scheduled follow-up	107 (35.4%)	138 (45.7%)	
	Death or dependency by the end of scheduled follow-up	138 (45.7%)	145 (48.0%)	
	Length of stay (days) in a hospital or institution or both (mean, SD)	11.23 (6.3)	12.1 (7.49)	
2. Effect size all other outcomes, endpoints	-			
Authors' conclusion	Beneficial effect of ASU on mortality compared to GMW lasting for a period of 5 years. After this period mortality rates were similar in both groups.			
VII Critical appraisal of study quality				
1.GRADE quality of evidence (low/moderate/high)	Low[6]			
2. Dropouts	Not addressed			
3. Results critical appraisal	Method of randomization not described Two short articles, hence, few details reported			

[5] The number reported in the Cochrane review ('Organized inpatient care for stroke', Stroke Unit Trialists' Collaboration, 2009, page 38) is 127.

[6] Rating is based on the fact that published data were only obtained from two abstracts.

Headings	Description		
I Study ID	Perth		
1. Reference	Hankey GJ, Deleo D, Stewart-Wynne EG. Stroke units: an Australian perspective. Australian and New Zealand Journal of Medicine 1997;27:437–8		
II Method			
1. Study design	Randomized controlled trial		
2. Source of funding/conflicts of interest	Not declared		
3. Setting	Royal Perth Hospital, Australia		
4. Sample size	N = 59 Stroke Unit (SU): 29 / General Medical Ward (GMW): 30		
5. Duration of the Study	Recruitment: 6 months (30 Jan – 30 Jul 1993) Follow-up: 6 months		
III Patient characteristics			
1. Eligibility criteria	Patients with first-ever stroke of less than seven days duration		
2. Patient characteristics		SU	GW
	N	29	30
	Age (Years, mean)	69	71
	Male / Female (n, %)	12 (41%) / 17 (59%)	16 (53%) / 14 (47%)
	Pathology of lesion on CT		
	Cerebral infarction (n, %)	24 (83%)	27 (90%)
	Cerebral hemorrhage (n, %)	5 (17%)	3 (10%)
3. Group comparability	Small groups: “Although treatment allocation was random, it is possible that, due to chance, the groups were not matched for major determinants of outcome”		
IV Intervention(s)			
1. Intervention(s)	Stroke unit with multidisciplinary team (SU)		
2. Comparator(s)	Care in general medical/geriatric ward (GW)		

V Results primary outcome				
1. Effect size primary outcome	Outcomes at 6 months			
		SU	GW	OR (95% CI)
	Death/Mortality	4	6	0.64 (0.2 – 2.5)
	Disability			0.63 (0.2 – 2.2)
	Death or disability			0.60 (0.2 – 1.7)
	Institutionalization	2	8	0.17 (0.03 – 0.93)
	Death or institutionalisation	(6)	(14)	0.30 (0.09 – 0.94)
	Additional data presented in the Cochrane review ('Organized Inpatient Care for Stroke', Stroke Unit Trialists' Collaboration 2009):			
		SU	GW	
	Death or dependency by the end of scheduled follow up	10/29	15/30	0.54 (0.19 – 1.49)
VI Results secondary and all other outcomes				
1. Effect size secondary outcome(s)	Outcomes at 6 months			
	Length of stay	SU	GW	
	Acute - days, mean ± SD, median (range)	24 ± 25, 18 (2-100)7	27 ± 19, 27 (1-79)8	
	Rehab - days, mean ± SD, median (range)	60 ± 33, 41 (31-116)	66 ± 33, 59 (16-136)	
	Acute + rehab - days, mean ± SD, median (range)	40 ± 49, 18 (2-171)	53 ± 47, 31 (1-174)	
	Readmission to hospital within 6 months (n)	2	4	
	Functional state			
	Rankin score 0-2 (independent survivors, n)	19	16	
	Barthel index 19-20 (independent survivors, n)	20	15	
	Rankin score 3-5 (dependent survivors, n)	6	8	
	Barthel index 0-18 (dependent survivors, n)	5	9	
2. Effect size all other outcomes, endpoints	-			

7 The number reported in the Cochrane review ('Organized inpatient care for stroke', Stroke Unit Trialists' Collaboration, 2009, page 55) is 24 (SD: 30)

8 The number reported in the Cochrane review ('Organized inpatient care for stroke', Stroke Unit Trialists' Collaboration, 2009, page 55) is 26.7 (SD: 30)

Authors' conclusion	Coordinated care in acute stroke assessment and intervention units by interested and competent stroke teams may be effective and may not be any more costly than conventional care. Needs to be evaluated by means of well-conducted clinical trials.
VII Critical appraisal of study quality	
1.GRADE quality of evidence (low/moderate/high)	Moderate
2. Dropouts	Not addressed
3. Results critical appraisal	Small trial, limited statistical power (n = 59) Short article, hence few details reported

Headings	Description
I Study ID	Goteborg-Sahlgren
1. Reference	Fagerberg et al. Effect of Acute Stroke Unit Care Integrated With Care Continuum Versus Conventional Treatment: A Randomized 1-Year Study of Elderly Patients- The Goteborg 70+ Stroke Study. Stroke. 2000;31:2578-2584.
II Method	
1. Study design	Randomized controlled trial
2. Source of funding/conflicts of interest	This study was supported by the Vårdal Foundation, Trygghetsfonden, the Swedish Stroke Association, John and Brit Wennerström's Foundation for Neurological Research, Felix Neuberg Foundation, Rune and Ulla Amlöv's Foundation for Neurological Research, Hjalmar Svensson Research Foundation, and King Gustav V and Queen Viktoria Foundation.
3. Setting	Sahlgrenska University Hospital, Göteborg University, Göteborg, Sweden.
4. Sample size	N = 249 Stroke Unit (SU): 166 / General medical ward (GW): 83
5. Duration of the Study	Recruitment: between February 1, 1993, and May 17, 1994 Follow-up: 1 year (mortality)
III Patient characteristics	
1. Eligibility criteria	Inclusion: Aged ≥ 70 years, living in the catchment area, acute focal neurological deficit of no apparent cause other than that of vascular origin, and willingness to participate Exclusion: Symptoms >7 days before admission to the stroke unit, known cerebral lesion with recognized need of care, extracerebral or subarachnoid hemorrhage or brain tumor, coma, and indication of specialized management, patients living in nursing homes, and those who encountered no available beds in the stroke units

2. Patient characteristics		Stroke Unit (SU) (n=166)	General medical ward (GW) (n = 83)
	Female sex, n (%)	110 (66)	45 (54)
	Mean age (all), y	80.1 ± 5.60	79.7 ± 5.50
	Final diagnosis		
	Cerebral infarction, n (%)	155 (93)	74 (89)
	Intracerebral hemorrhage CT, n (%)	7 (4)	4 (5)
	Transient ischemic attack, n (%)	2 (1)	3 (4)
	Other diagnosis, n (%)	2 (1)	2 (2)
3. Group comparability	The groups were comparable at entry except that a history of angina pectoris was more common in the stroke unit group.		
IV Intervention(s)			
1. Intervention(s)	Stroke unit care was organized in a care continuum with 2 acute stroke units and 2 stroke units at geriatric wards, which collaborated in terms of treatment principles, training, and work procedures. The members of each stroke unit team were a physician, a stroke nurse, a physiotherapist, and an occupational therapist. A speech therapist was consulted when needed. Each stroke unit was organized with a team approach to patient care and regular team conferences. There was a continuous program of education. All patients were examined by CT, ECG, and routine blood tests on admission. All patients underwent a standardized examination and a systematic observation of neurologicaldeficits, blood pressure, and cardiac and pulmonary disorders. Body temperature, glucose levels, and fluid and electrolyte balance were monitored. Hypertension was not treated during the initial days except in the case of patients with very high blood pressure levels. Careful discharge planning was practiced, and there was no limit to the length of time the patients could stay in the stroke units. However, patients who needed more than a few weeks of rehabilitation were referred to 1 of 2 geriatric stroke units working according to principles similar to those used at the acute stroke units		
2. Comparator(s)	The other patients were treated in 6 general medical wards. There was no standardized program for this treatment, and there were no extra resources for the management of stroke patients. CT of the brain was performed in 90% of patient. Physiotherapy and occupational therapy were given if prescribed by the physicians in charge.		
V Results primary outcome			
1. Effect size primary outcome		3 weeks	
		SU (n=166)	GW (n=83)
	At home, n (%)	77 (46)	37 (44)
	In acute hospital, n (%)	23 (14)	3 (4)
	In geriatric ward, n (%)	45 (27)	29 (35)

	95% CI	3 months			12 months		
		SU (n=166)	GW (n=83)	95% CI	SU (n=166)	GW (n=83)	95% CI
At home, n (%)	-11% to 16%	112 (68)	51 (61)	-7% to 19%	102(61)	49 (59)	-11% to 15%
In acute hospital, n (%)		1 (1)	0	0 0			
In geriatric ward, n (%)	-20% to 5%	17 (10)	12 (15)	-13% to 4%	3 (2)	2 (2)	

	In other wards, n (%)	5 (3)	5 (6)		0	0		0	0		
	In institution, n (%)	1 (1)	1 (1)		14 (8)	7 (8)		16 (10)	13 (16)	-15% to 3%	
	Dead, n (%)	15 (9)	8 (10)	-8% to 7%		22 (13)	13 (16)	-12% to 7%		45 (27)	19 (23) -7% to 16%
VI Results secondary and all other outcomes											
1. Effect size secondary outcome(s)			3 months					12 months			
			SU (n=164)	GW (n=81)	95% CI			SU (n=164)	GW (n=81)	95% CI	
	Dead or institutional care, n (%)		51 (31)	31 (38)	-20% to 6%	61 (37)		33 (41)	-17% to 10%		
	Dead or dependent, n (%)		107 (65)		52 (64)	-12% to 14%		108 (66)		54 (67)	-14% to 12%
	HR-QoL (Nottingham Health Profile)			22.5	23.9	NS	23.2	26.0	NS		
2. Effect size all other outcomes, endpoints	Mean (median)										
		0-3 days		3 weeks		3 months		12 months			
		SU (n=161)	GW (n=80)	SU (n=150)	GW (n=74)	SU (n=139)	GW (n=65)	SU (n=116)	GW (n=57)		
	SSS Neurological score (range 0-48)					32 (37)	31 (37)	39 (44)	37 (44)	42 (46)	41 (45) 43 (45) 41 (46)
	Barthel Index score (range 0-100)			44 (45)	42 (40)	71 (88)	67 (85)	80 (95)	79 (95)	82 (95)	76 (90)
	Sunnaas ADL index score (range 0-36)					13 (11)	12 (12)	22 (25)	20 (23)	25 (29)	24 (28) 26 (29) 24 (28)
	The mean length of stay after the index hospitalization was 28.3 (median 15, SD=17 reported by the Cochrane review) days in the acute stoke units integrated with a care continuum and 35.8 (median 10, SD=17 reported by the Cochrane review) days in the general medical ward group (p=NS).										
Authors' conclusion	- Stroke unit care did not result in more surviving patients being at home after 1 year or improved ADL scores. - In patients with concomitant cardiac disease, there was a reduction in death or institutional care after 3 months in the SU group but this effect did not remain after 1 year.										
VII Critical appraisal of study quality											
1. Assessment on risk of bias (low/moderate/high)	High										
2. Dropouts	SU: 45 (27%) deaths, GW: 19 (23%) deaths										
3. Results critical appraisal	Unclear randomization method										

Headings	Description			
I Study ID	Groningen			
1. Reference	Sulter et al. Admitting Acute Ischemic Stroke Patients to a Stroke Care Monitoring Unit Versus a Conventional Stroke Unit A Randomized Pilot Study. Stroke. 2003;34:101-104.			
II Method				
1. Study design	Randomized controlled trial with blinded outcome assessment			
2. Source of funding/conflicts of interest	Supported by the Academic Hospital Groningen			
3. Setting	Academic Hospital Groningen, The Netherlands			
4. Sample size	N = 54 Stroke-care monitoring unit: 27 / Conventional SU: 27			
5. Duration of the Study	Recruitment: 1-year period Follow-up: 3 months			
III Patient characteristics				
1. Eligibility criteria	- Clinical diagnosis of acute ischemic stroke in the carotid artery territory - between the age of 18 and 80 years - hemiparesis, with the affected outstretched arm unable to hold a 90° position for 10 seconds - conscious - symptoms had started within 24 hours before admission - ineligible for intravenous thrombolysis according to the NINDS criteria - Excluded: Patients treated iv tPA, previous stroke with residual neurological impairment or disorder interfering with neurological/functional assessments, life-threatening concurrent illness.			
2. Patient characteristics		Stroke Care Unit (n=27)	Conventional Stroke Unit (n=27)	p
	Mean age (SD), y	68.0 (14.7)	67.6 (16.0)	0.92
	Male gender (%)	15 (56)	10 (37)	0.28
	Stroke type (n)			
	Total anterior circulation syndrome	9	9	
	Partial anterior circulation syndrome	7	7	
	Lacunar anterior syndrome	11	11	
	Baseline stroke severity (NIHSS)			
	Mean (SD)	11. (7.4)	11.2 (7.5)	0.94
	≤ 5 (n)	8	8	

	6-13 (n)	9	9
	≥ 14(n)	10	10
3. Group comparability	The groups were well matched for baseline characteristics, stroke subtype, stroke severity, vascular risk factors, and prognostic factors		
IV Intervention(s)			
1. Intervention(s)	Patients in the SCMU were continuously monitored with Marquette Eagle 4000 monitors for at least 48-hours (and longer if required) for cardiac rhythm (5-lead ECG), body temperature (rectal thermometer), oxygen saturation (pulse oximeter), and blood pressure (noninvasive automatic measurement every 15 minutes), thereby allowing immediate interventions. After the first 48 hours, monitoring was stopped when the condition of patient was stable and the physiological variables showed no abnormality over the last 24 hours. After the monitoring period, patients were further treated in the conventional SU.		
2. Comparator(s)	In the conventional SU, observations consisted of manual measurement of body temperature, blood pressure, and heart rate 4 times a day. Oxygen saturation levels were determined when deemed necessary by the attending physician. Both arms: All patients received a CT scan of the head before randomization. ECG and routine blood tests were performed on admission, and other diagnostic procedures were performed when indicated. Strategies to correct hypotension or excessive hypertension, hypoxia, elevated body temperature, and hyperglycemia, once detected, were identical for both groups. The protocol for both units also included a swallowing test for the detection of dysphagia. Both units were organized with a team approach to nursing and rehabilitation. Key members of the team were trained stroke nurses and physiotherapists who developed a specific mobilization program, consisting of functional training and a modified motor relearning program.		
V Results primary outcome			
1. Effect size primary outcome		SCMU	Conventional SU	Odds Ratio
	Poor outcome, n (%)*	7 (25.9%)	13 (48.1%)	0.37 (95% CI, 0.12 to 1.18), p = 0.15
	Mortality	1 (3.7%)	7 (25.9%)	0.11 (95% CI, 0.02 to 0.96), p = 0.05
	* defined as either a modified Rankin scale (mRS) score ≥ 4 or a Barthel Index (BI) < 60 or the need for institutional care due to stroke			
	Additional data presented in the Cochrane review ('Organized inpatient care for stroke', Stroke Unit Trialists' Collaboration, 2009):			
			SCMU	Conventional SU
	Death or institutional care by the end of scheduled follow up		13/27	18/27
	Death or dependency by the end of scheduled follow up		7/27	13/27
VI Results secondary and all other outcomes				
1. Effect size secondary outcome(s)				

2. Effect size all other outcomes, endpoints	Time (mean ± SD) to discharge from the hospital was less in the SCMU group than in the conventional SU group (16 ± 5 vs. 25 ± 7 days)
Authors' conclusion	- Admission of acute stroke patients to an SCMU may reduce mortality and poor outcome - A larger trial is required to confirm these findings
VII Critical appraisal of study quality	
1. GRADE quality of evidence (low/moderate/high)	Moderate
2. Dropouts	SMCU: 1 death (3.7%), CSU: 7 deaths (25.9%) None of the patients were lost to follow-up
3. Results critical appraisal	Unclear randomization method Small sample size

Headings	Description
I Study ID	Joinville
1. Reference	Cabral et al. Study comparing the stroke unit outcome and conventional ward treatment: a randomized study in Joinville, Brazil. Arq Neuropsiquiatr 2003, 61(2A):188-193.
II Method	
1. Study design	Randomized controlled trial with blinded outcome assessment
2. Source of funding/conflicts of interest	Study was supported by grants from the CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior)
3. Setting	São José Hospital in Joinville, Brazil
4. Sample size	N = 74 Stroke Unit (SU): 35 / General medical ward (GW): 39
5. Duration of the Study	Recruitment: March to December 2000 Follow-up: 6 months
III Patient characteristics	
1. Eligibility criteria	- First or recurrent stroke as defined by the National Institute of Neurological Disorders and Stroke (NINDS) within seven days period to admission - Excluding patient requiring intensive care unit, mechanical pulmonary ventilation, transient ischemic events, subarachnoid hemorrhage or death in first 24-hours after hospitalization.

2. Patient characteristics		SU (n=35)	GW (n=39)	p
	Average age, years (SD)	64.8 (12.9)	70.7 (8.8)	0.22
	Men average age, years (SD)	63.5 (13.1)	70.9 (8.3)	0.30
	Women average age, years (SD)	66.6 (12.8)	70.6 (9.7)	0.34
	Female	15 (42.8%)	16 (41.0%)	0.87
	First week Clinic State			
	Mild stroke	13 (37.2%)	16 (41.0%)	0.91
	Moderate stroke	13 (37.2%)	9 (23.0%)	0.28
	Severe stroke 8 (22.8%)	14 (35.8%)	0.33	
	SSS	35 (15-35)	29 (12-45)	0.39
	BI	30 (10-55)	29 (12-45)	0.67
	Hospital stay period, days (SD)	11.0 (8.51)	12.6 (10.8)	0.50
3. Group comparability	Age, gender, stratified average income in MW (minimum wage), educational status, previous risk factors for atheriosclerosis and incidence of intracerebral haematoma were matched among both groups.			
IV Intervention(s)				
1. Intervention(s)	SU has nine beds devoted to acute and rehabilitation treatment of stroke patients. The multiprofessional team is composed by a neurologist as well as stroke trained nurses, physiotherapists, occupational therapist, psychologist and speech therapist. Nursing teams attended to an annual one-month stroke actualization course. Physiotherapists have used the Bobath method. Stroke information booklets were received by patients at hospital discharge.			
2. Comparator(s)	No specific general medical ward was used for this study and patients were allocated according bed availability. Routine medical investigation or treatment by neurologist as well as physiotherapy and occupational therapy were identical to that undertaken at SU. Speech therapist assessment was provided when required.			
V Results primary outcome				
1. Effect size primary outcome	Mortality (%)			
		SU	GW	RR (CI) p
	10 days	8.5	12.8	0.66 (0.17-2.59) 0.41
	1 month	14.2	28.2	0.50 (0.19-1.31 0.24
	3 months	17.4	28.2	0.60 (0.25-1.47) 0.39
	6 months	25.7	30.7	0.83 (0.40-1.74) 0.41

	Hospital stay period SU GW p Days (SD) 11.0 (8.51) 12.6 (10.8) 0.50 Scales (median) SSS BI SU GW p SU GW p Day 1 35 25 30 20 Day 5 43 37 50 25 Month 3 44 46 65 75 Month 6 39 51 0.969 75 85 0.815
VI Results secondary and all other outcomes	
1. Effect size secondary outcome(s)	-
2. Effect size all other outcomes, endpoints	Outcome 6 months SU (n=35) GW (n=39) OR (CI 95%) Death/dependence 18 (51.4%) 23 (58%) 0.73 (0.59-1.84) Independence 17 (48.6%) 16 (42%) 1.35 (0.54-33.41) Patients with 0-2 scores were considered to be independent while 3-5 scores were regarded as dependent in Rankin scale Additional data presented in the Cochrane review ('Organized inpatient care for stroke', Stroke Unit Trialists' Collaboration, 2009): SU GW Death or institutional care by the end of scheduled follow up 9/35 12/39
Authors' conclusion	- No significant benefit was found in SU patients compared to GW group. - An evident benefit in absolute numbers was observed in lethality, survival curve and number needed to treat (NNT) in thirty days period after stroke. - Further collaborative studies or increased number of patients are required to define the role of SU.
VII Critical appraisal of study quality	
1. GRADE quality of evidence (low/moderate/high)	Low
2. Dropouts	SU:25.7%dead GW 30.7% dead "Four patients were lost due to changed address"

3. Results critical appraisal	Poor method of randomization Small sample size to prove statistical significance Concise description of intervention

Headings	Description			
I Study ID	Orpington 2000			
1. Reference	Kalra et al. Alternative strategies for stroke care: a prospective randomized controlled trial. Lancet 2000; 356: 894–899			
II Method				
1. Study design	Randomised controlled study with blinded outcome assessment			
2. Source of funding/conflicts of interest	The project was funded by the NHS R&D Executive's Health Technology Assessment Programme (Grant 93/03/026). A Evans is supported by a grant from the Stroke Association. The service aspects of the project were funded by a grant from the Bromley Health Authority.			
3. Setting	The study was done in a suburban district in the UK with 291 000 residents			
4. Sample size	N = 457 Stroke Unit: 152 / Stroke team: 152 / Home care: 153			
5. Duration of the Study	Between April 1995, and October 1999 Follow-up: 12 months			
III Patient characteristics				
1. Eligibility criteria	- Presentation no later than 72 h after stroke onset - Patients with moderately severe stroke (who could be supported at home with nursing, therapy, and social services) - Excluded: patients with mild or severe strokes, those admitted to other hospitals, and those with atypical neurological features who needed specialized assessments or investigation to establish a diagnosis of stroke. Patients who were institutionalized or had severe disability before stroke were also excluded.			
2. Patient characteristics		Stroke unit	Stroke team	Home care	p
	Demography	(n=148)	(n=150)	(n=149)	
	Median age, years (IQR)	75 (72–84)	77·3 (71–83)	77·7 (67–83)	0·09
	Females	69 (47%)	76 (51%)	68 (46%)	0·63
	Living alone	50 (34%)	55 (37%)	50 (34%)	0·82
	Stroke characteristics				
	Stroke subtypes				0·42
	Total anterior circulation syndrome	18	11	14	

	Partial anterior circulation syndrome	77	81	82	
	Lacunar syndrome	42	43	47	
	Posterior circulation syndrome	11	15	6	
	Barthel index (0–20)	8 (5–12)	9 (5–12)	10 (4–14)	0·46
3. Group comparability	The baseline characteristics of patients, stroke type and severity, level of impairment, and initial disability were well matched between the three groups.				
IV Intervention(s)					
1. Intervention(s)	Stroke unit: Care on the stroke unit (acute and rehabilitation) was provided by a stroke physician supported by a multidisciplinary team with specialist experience in stroke management. There were clear guidelines for acute care, prevention of complications, rehabilitation, and secondary prevention. Routine management involved joint assessments and goal setting, coordinated treatment, and planned discharges.				
2. Comparator(s)	Stroke Team: Patients allocated to stroke-team care were managed on general medical wards and remained under the care of admitting physicians. All patients were seen by a specialist team (doctor, nurse, physiotherapist, occupational therapist) with expertise in stroke management. The team undertook stroke assessments and collaborated with ward-based nursing and therapy staff in goal setting, planning of treatment, discharge, arrangement, and liaison with patients and relatives. Day-today treatment was provided by staff on the ward.				
V Results primary outcome					
1. Effect size primary outcome	Endpoint	Stroke unit	Stroke team	Unit vs. team	
			OR (95% CI)	p	
	Mortality or institutionalization				
	3 months	15/152 (10%)	30/151 (20%)	0·50 (0·29–0·87) 0·01	
	6 months	19/152 (13%)	37/149 (25%)	0·40 (0·24–0·67) 0·001	
	12 months	21/152 (14%)	45/149 (30%)	0·46 (0·30–0·72) 0·001	
	Mortality				
	3 months	6/152 (4%)	18/151 (12%)	0·33 (0·14–0·77) 0·01	
	6 months	10/152 (7%)	25/149 (17%)	0·39 (0·20–0·76) 0·006	
	12 months	13/152 (9%)	34/1499 (23%)	0·37 (0·21–0·66) 0·001	
	Institutionalization				
	3 months	9/152 (6%)	12/151 (8%)	0·75 (0·33–1·69) 0·49	
	6 months	9/152 (6%)	12/149 (8%)	0·74 (0·33–1·67) 0·47	

[9] Number reported in the Cochrane review was 152.

	12 months	8/152 (5%)	11/149 (7%)		0·71 (0·29–1·72) 0·45
	(Data related to home care are not shown)				
	Unpublished data presented in the Cochrane review ('Organized inpatient care for stroke', Stroke Unit Trialists' Collaboration, 2009):				
				Stroke unit	Stroke team
	Death or dependency by the end of scheduled follow up			61/152	73/152
VI Results secondary and all other outcomes					
1. Effect size secondary outcome(s)	Endpoint	Stroke unit	Stroke team OR (95% CI)		Unit vs. team p
	Modified Rankin 0–3				
	3 months	125/152 (83%)	111/151 (74%)		1·13 (1·01–1·28) 0·04
	12 months	129/152 (85%)	99/149 (66%)		1·29 (1·13–1·47) 0·001
	Median modified Rankin (IQR)				
	3 months	2 (2–3)	3 (2–4)	..	0·09
	12 months	2 (1–3)	2 (1–5)	.	0·005
	Barthel 15–20				
	3 months	123/152 (82%)	106/151 (70%)		1·16 (1·02–1·32) 0·02
	12 months	131/152 (87%)	102/149 (69%)		1·27 (1·12–1·44) 0·001
2. Effect size all other outcomes, endpoints	Endpoint	Stroke unit	Stroke team		
	Length of hospital stay (days)				
	Mean (SD)	32·0 (29·6)	29·5 (40·1)	Median (IQR)	22·5 (8–48) 16 (10–33)
Authors' conclusion	Stroke units are more effective than a specialist stroke team or specialist domiciliary care in reducing mortality, institutionalization, and dependence after stroke.				
VII Critical appraisal of study quality					
1.GRADE quality of evidence (low/moderate/high)	High				
2. Dropouts	SU: 13 dead (9%), ST: 34 dead (23%), 3 lost to FU (2%)				
3. Results critical appraisal	Well-conducted/reported study				

Headings	Description		
I Study ID	Pavia		
1. Reference	Cavallini A, Micieli G, Marcheselli S, Quaglini S. Role of monitoring in the management of acute ischaemic stroke patients. Stroke 2003;34(11):2599–603.		
II Method			
1. Study design	Controlled Clinical Trial		
2. Source of funding/conflicts of interest	None reported		
3. Setting	Cerebrovascular Department, IRCCS Foundation Hospital C. Mondino, Pavia, Italy		
4. Sample size	N = 268 Stroke Unit (SU): 134 / Cerebrovascular Unit (CU): 134		
5. Duration of the Study	Recruitment: January 1999 to April 2001 Follow-up: until discharge		
III Patient characteristics			
1. Eligibility criteria	- First-ever ischemic stroke - admitted within 36 hours of stroke onset		
2. Patient characteristics		SU (n=134)	CU (n=134)
	Median age, y (range)	73 (41–88)	72 (40–92)
	Male sex, % (n)	59 (79)	57 (77)
	Median NIHSS on admission (range)	8 (5–20)	7 (3–21)
	Median BIS on admission (range)	9 (0–19)	9 (0–19)
	Clinical Diagnosis		
	Total anterior circulation infarct (TACI)	7%	5%
	Partial anterior circulation infarct (PACI)	39%	39%
	Lacunar infarct (LACI)	45%	45%
	Posterior circulation infarct (POCI)	10%	11%
3. Group comparability	Sex distribution, NIHSS score, and BI score on admission were similar in the 2 groups. The distribution of the patients across 3 time intervals between onset and admission (0-12, 12-24 or 24-36 hours) was similar in the 2 groups Additionally; the distribution of stroke diagnoses was similar in both groups. No significant differences were detectable between the distribution		

	of the risk factors in the SU and CU subjects.
IV Intervention(s)	
1. Intervention(s)	Stroke Unit (SU): All subjects undergo, on admission, at least 72 hours of continuous monitoring by bedside monitors
2. Comparator(s)	Cerebrovascular Unit (CU): Blood pressure and heart rate are recorded automatically every 4 hours during the first 3 days of hospitalization and 4 times a day thereafter, while body temperature is measured 3 times daily. Oxygen saturation, respiratory frequency, and ECG are performed on admission to the CU. These parameters are measured again in the event of an adverse change in clinical conditions. Both: Both care units follow the same acute management and early rehabilitation guidelines (standardized diagnostic assessment procedures, medical treatments for acute stroke and adverse events, nursing protocols, rehabilitation treatments, and prevention of complications). The same multidisciplinary stroke team works in both the SU and the CU. Moreover, both units employ the same kind of electronic patient record chart, which is completed daily by all those involved in the management of the stroke patient.
V Results primary outcome	
1. Effect size primary outcome	SU (n=134) / CU (n=134) / OR (95% CI), p Mortality at discharge, n, (%): 6 (4) / 8 (6) / 0.74 (0.25 – 2.17), p=0.58 Good outcome,* n, (%): 114 (85) / 78 (58) / 2.63 (1.4 - 4.8), p<0.02 * Defined as alive and Modified Rankin Scale score at discharge of 0–3. Unpublished data presented in the Cochrane review ('Organized inpatient care for stroke', Stroke Unit Trialists' Collaboration, 2009): SU / CU Death or institutional care by the end of scheduled follow up: 60/134 / 58/134 Death or dependency by the end of scheduled follow up: 20/134 / 56/134
VI Results secondary and all other outcomes	
1. Effect size secondary outcome(s)	The mean LOS was 9.2 days (SD=4.9 reported in Cochrane) in the SU patients and 17.1 days (SD=10.8 reported in the Cochrane) in the CU patients (P<0.0001).
2. Effect size all other outcomes, endpoints	Univariate logistic analysis revealed a highly significant relationship between outcome and coronary heart disease (P=0.0003), NIHSS and BI score on admission (both p<0.00001), type of care (p= 0.0175), and age (P<0.00001).
Authors' conclusion	- Admission of acute stroke patients to a monitoring SU may positively influence their outcome at discharge. - Confirmation of findings in larger trial needed
VII Critical appraisal of study quality	

1. GRADE quality of evidence (low/moderate/high)	Low
2. Dropouts	Not addressed. SU: 6 deaths (4%) CU: 8 deaths (6%)
3. Results critical appraisal	Controlled clinical trial without randomized allocation

Headings	**Description**			
I Study ID	Stockholm			
1. Reference	Von Arbin. A study of stroke patients treated in a non-intensive stroke unit or in general medical wards. Acta Med Scand 1980;208:81-85.			
II Method				
1. Study design	Controlled Clinical Trial			
2. Source of funding/conflicts of interest	Study was supported by grants from Clas Groschinsky Memorial Fund, the Swedish National Association against heart and chest diseases and the Swedish planning and rationalization institute of health and social services (SPRI)			
3. Setting	Casualty department, serafimerlasarettet hospital, Stockholm, Sweden			
4. Sample size	N = 494 Stroke Unit (SU): 269 / General Medical Ward (GMW): 225			
5. Duration of the Study	Dec 1976 – Nov 1978 Follow-up: during hospital stay			
III Patient characteristics				
1. Eligibility criteria	- Suspected acute cerebrovascular disease - Transient Ischaemic Attacks (TIAs): one or more episodes of focal neurological deficit within last month - Progressive and manifest stroke: patients with acute onset of focal neurological deficit during the previous week (without preceding trauma to the head)			
2. Patient characteristics		SU (n=269)	GMW (n=225)	p
	Proportion male (%)	45	37	
	Age [mean (range)]	73 (50 – 92)	74 (41 – 100)	
	Age women (mean)	75	76	
	Age men (mean)	71	72	

	Mean neurological score on admission	61	61	
	Final diagnosis at discharge (%) – ICD criteria			
	Cerebral haemorrhage	8	10	NS
	Cerebral thrombosis	58	25	<0.001
	Cerebral embolism	24	16	<0.05
	TIA	8	14	<0.05
	Acute ill-defined CVD	2	34	<0.001
3. Group comparability	Difference in sex distribution between SU and GMW was not statistically significant. The prevalence of important previous diseases (medical history) did not differ between the two groups. Cerebral thrombosis and cerebral embolism were significantly more common in the SU, while TIA was more frequently diagnosed in the GMW.			
IV Intervention(s)				
1. Intervention(s)	SU: Preplanned investigation program including lumbar punction with spectrophotometry, skull x-ray with echoencelophalography and brain scan.Strict criteria for diagnosis and treatment. Early active approach to mobilization and rehabilitation planning. Education and development of close collaboration among personnel.			
2. Comparator(s)	GMW: Principles of investigation and management of stroke differed, according to routine of consulting physicians. Both: Resources for general patient care in the GMW and SU were not different			
V Results primary outcome				
1. Effect size primary outcome		SU (n=269)	GMW (n=225)	p
	Mortality, %	18	16	NS
	Discharged to			
	Home, %	44	48	NS
	Rehabilitation hospital, %	36	35	NS
	Other clinics, %	2	1	NS
	Mentioned in Cochrane review Organized inpatient (stroke unit) care for stroke (Review)' (Stroke Unit Trialists' Collaboration, 2009) as:			
	Death, n/N	49/269	4510/225	

[10] Maybe an error here, as 16% mortality rate indicates number of death of 36.

	Death or institutional care, n/N	150/269 117/225		
VI Results secondary and all other outcomes				
1. Effect size secondary outcome(s)		SU (n=269)	GMW (n=225)	p
	Length of hospital stay (days)	21	20	NS
	Cochrane review Standard deviation of 20 days in both groups			
2. Effect size all other outcomes, endpoints	-			
Authors' conclusion	SU allowed decrease of number of ill-defined CVD diagnosis Short-term outcome did not differ between the 2 groups. There was no difference regarding mortality or length of patient stay.			
VII Critical appraisal of study quality				
1.GRADE quality of evidence (low/moderate/high)	Low			
2. Dropouts	SU: 49 deaths GMW: 35 (?) deaths			
3. Results critical appraisal	- No random allocation - (final) diagnosis at baseline differs between groups - This study focused on diagnosis procedure rather other components of SU. Resource for SU and GMW was the same.			

Headings	Description		
I Study ID	Trondheim		
1. Reference	Indredavik et al. Benefit of stroke unit: a randomised controlled trial. Stroke 1991;22:1026–1031. Indredavik et al. Stroke unit treatment: long-term effects. Stroke 1997;28:1861–1866. Indredavik et al. Stroke unit treatment: 10 year follow-up. Stroke 1999;30:1524–1527.		
II Method			
1. Study design	Randomized controlled trial		
2. Source of funding/conflicts of interest	This study was supported by grants from the Norwegian Council on Cardiovascular Diseases, The Fund of Cardiovascular Research, and the Stroke Unit's Fund of Stroke Research, University Hospital of Trondheim, Trondheim, Norway.		
3. Setting	University Hospital of Trondheim		
4. Sample size	N = 220 Stroke Unit (SU): 110 / General Medical Wards (GMW): 110		
5. Duration of the Study	Recruitment: February 11, 1986, to October 15, 1987 Follow-up: 10 years, 5 years and 52 weeks		
III Patient characteristics			
1. Eligibility criteria	- Acute focal neurological deficits of no apparent cause other than that of vascular origin - Excluded: patients whose symptoms began >1 week before arrival at the hospital, unconscious patients, patients living in nursing homes, patients from other districts, patients with subdural hematoma, subarachnoid hemorrhage, or brain tumor, patients who arrived at the hospital when the stroke unit was full		
2. Patient characteristics	General characteristics	Unit (n = 110)	Wards (71 = 110)
	Sex (% female)	49	50
	Age (mean ± SD yr)	72.2 ± 8.6	73.7 ± 8.7
	Functional state		
	SSS Prognostic Score (mean)*	14.9	15.1
	SSS Neurological Score (mean)*	25.4	26.5
	Barthel Index (mean)	46.9	43.7
	Time from onset to randomization (mean hrs ± SD)	16.5 ± 16.4	15.8 ± 21.1
	Final Diagnosis		
	Nonembolic infarction	56	57
	Embolic infarction	33	29
	Hemorrhage	14	15

	Transient ischemic attack	3	4
	Tumor in central nervous system	3	1
	Subdural hematoma	0	2
	Epileptic seizures	0	1
	Septicemia	1	1

* developed by the Scandinavian Stroke Study Group: giving a prognostic score for acute evaluation and a long-term score for subsequent changes in neurological deficits and functional state over longer periods. This latter score is referred to as the neurological score in this study.

3. Group comparability	No significant difference existed concerning sex, age, medical history, marital status, time from debut of symptoms to admission, and functional impairment on admission. The distribution of diagnoses was almost identical in the two groups.
IV Intervention(s)	
1. Intervention(s)	Stroke Unit: Standardized program with regard to diagnostic evaluation, acute treatment, and rehabilitation. All patients received computed tomography (CT) within 24 hours, electrocardiogram, and routine blood tests on admission; other diagnostic procedures were performed when indicated. Acute treatment: During the first days in the stroke unit all patients underwent a standardized systematic observation and examination of neurological deficits, blood pressure, cardiac and pulmonary disorders, fever, glucose level, and fluid and electrolyte balance. Oxygen therapy was employed in the presence of decreased oxygen blood levels, but glucose infusion was avoided during the first 2 days, antiedema agents were not used, and hypertension was not treated during the acute stage except for very high blood pressure levels (>250/130 mm Hg). In patients with embolic infarction or progression of neurological deficits, the early use of anticoagulants was standard treatment in patients <75 years old. In older patients anticoagulants were used only after careful individual evaluation. We also used low doses of heparin (5,000 IU s.c. twice a day) to prevent deep venous thrombosis in patients with extensive paresis but no sign of hemorrhage on CT scan. Organization: The stroke unit was organized with a team approach to the patient's care. When a patient arrived, diagnostic and functional evaluation was done immediately and a treatment plan was made. The staff was well trained in the rehabilitation of stroke patients, and a systematic program for recovery of function was started soon after arrival. We believed that giving information to the patient and relatives was extremely important and designated a particular stroke nurse to manage these aspects.
2. Comparator(s)	GMW: Six wards in the Department of Medicine received stroke patients. Treatment in these wards was the common one for patients with acute stroke in Norwegian hospitals, but there was no standardized program for diagnostic evaluation and treatment. Physical therapy and occupational therapy were given when the physicians in the wards prescribed it.
V Results primary outcome	
1. Effect size primary outcome	Mortality

intention-to-treat analysis	Stroke Unit (n = 110)	Wards (n = 110)

	Time	No.	%	No.	%	p
	6 weeks					
	Dead	8	7.3	19	17.3	0.027
	In institution	40	36.3	55	50.0	0.020
	At home	62	56.4	36	32.7	0.0004
	52 weeks					
	Dead	27	24.6	36	32.7	0.155
	In institution	14	12.7	25	22.7	0.016
	At home	69	62.7	49	44.6	0.002
	5 years					
	Dead	65	59.1	78	70.9	0.041
	In institution	7	6.4	12	10.0	0.230
	At home	38	34.5	20	18.2	0.006
	10 years					
	Dead	83	75.5	96	87.3	0.0082
	At institution	6	5.4	5	4.5	0.75
	Home	21	19.1	9	8.2	0.0184
VI Results secondary and all other outcomes						
1. Effect size secondary outcome(s)	BI/SSS Scores	Stroke Unit (n = 77)		Wards (n = 71)		p
	6 weeks					
	Barthel index (mean)	79.7		65.8		0.0014
	SSS Neurological score (mean)	38.7		34.3		0.007
	52 weeks					
	Barthel index (mean)	84.7		72.4		0.001
	SSS Neurological score (mean)	40.1		35.8		0.004
	BI scores - Independence	Stroke Unit (n = 110)		Wards (n = 110)		p
	5 years					
	BI Score ≥ 95	26 (23.6)		10 (9.1)		0.004
	BI Score ≥ 60	38 (34.5)		20 (18.2)		0.006

	BI (mean)	82.6	71.1	0.042
	BI (median)	95	85	
	10 years			
	BI score ≥ 95, n (%)	14 (12.7)	6 (5.4)	0.0606
	BI score ≥ 60, n (%)	22 (20.0)	9 (8.2)	0.0118
	Quality of life (for alive patients only):			
	5 years		Stroke Unit	Wards
			n=37	n=25
	Nottingham Health Profile (NHP) Global Scores			
	Method A		77.7	63.1
	Method B		78.0	63.3
	Visual analogue scale (VAS)		72.8	50.7
	Length of institution stay			
	(SD reported by Cochrane)		75 (114.8)	123 (145.8)
	* Cochrane review mentions 54/110 patients in SU and 81/110 in GMW are death or dependent after 52 Weeks			
2. Effect size all other outcomes, endpoints	The maximum period of treatment in the SU was 42 days (average 16 days). The mean time in institutions, including nursing homes, during the first year after the stroke was 75 days for the stroke unit group and 123 days for the general medical wards group (p=0.004 by on-treatment analysis).			
Authors' conclusion	- A combination of acute medical treatment and early intensive rehabilitation in a stroke unit increases the proportion of patients able to live at home, improves functional outcome, reduces the need for institutional care, and reduces early mortality. - Care of patients with acute stroke in a combined acute treatment and rehabilitation SU improves 10-year survival and functional state and increases the proportion of patients able to live at home 10 years after the stroke.			
VII Critical appraisal of study quality				
1.GRADE quality of evidence (low/moderate/high)	Moderate			
2. Dropouts	Apart from death, none of the patients were lost from follow-up (in the primary study).			
3. Results critical appraisal	Brief description of randomization procedure (serially numbered sealed envelopes) Prognostic and neurological scores on admission were evaluated without any kind of blinding.			

Headings	Description		
I Study ID	Umea		
1. Reference	Strand et al. A non-intensive stroke unit reduced functional disability and the need for long-term hospitalisation. Stroke 1985;16:29–34		
II Method			
1. Study design	Controlled Clinical Trial		
2. Source of funding/conflicts of interest	The study was supported by grants from Umea University, Mangberg's Fund and the National Association against Heart and Chest Diseases.		
3. Setting	Umea University Hospital, Umea, Sweden		
4. Sample size	N = 293 – Non-intensive stroke unit: 110 / General medical wards (GMW): 183		
5. Duration of the Study	Recruitment: 16-month period (October 1979 to January 1981) Follow-up: 1 year		
III Patient characteristics			
1. Eligibility criteria	- All patients, regardless of age, who without preceding trauma to the head present with focal neurological dysfunction with a duration not exceeding one week or patients with TIA (transitory ischemic attack) during the last week. - Excluded: Patients with symptoms of dizziness and/or disturbance of consciousness without focal neurological signs		
2. Patient characteristics		SU (n=110)	GMW (n=183)
	Age, years (mean ± SD)	72 ± 11	73 ± 9
	Men/Women (%)	58 / 42	54 / 46
	Diagnosis at discharge by ICD criteria		
	TIA (%)	10	7
	Non-embolic brain infarction (%)	36	41
	Embolic brain infarction (%)	35	17
	Intercerebral hemorrhage (%)	14	10
	Acure ill-defined CVD (%)	5	25
3. Group comparability	Patients admitted to the stroke unit did not differ from stroke patients admitted to general medical wards in age or sex distributions. A history of heart disorder was somewhat more commonly observed among patients admitted to the stroke unit, otherwise the prevalence of concomitant disorders were comparable in the two groups. Patients admitted to the stroke unit did not differ from those admitted to general medical wards in the prognostic indicators recorded — level of consciousness, extent of neurological deficit and ability to walk. Mean interval from the onset of symptoms to admission was identical (12 hrs) in the two groups. As could be expected, the proportion of ill-defined acute cerebrovascular disease was high among the patient treated in the general medical wards		

IV Intervention(s)							
1. Intervention(s)	Stroke Unit: Essential features of our stroke unit include (a) team work, (b) a program of staff education directed to improve knowledge and to promote a dedicated attitude in the care of stroke patients, (c) very early and determined rehabilitation (d) active participation of family members in the rehabilitative efforts, and (e) education of patients and family members. Members of the stroke team are (a) a physician working part-time in the unit, (b) a nurse (full-time) who follows a modified primary nursing approach including contacts with family members and social institutions; only occasionally is a social worker consulted, (c) a physiotherapist (part-time) and (d) an occupational therapist (part-time). Nurse's aides on the ward have particular training and experience in care of stroke patients. There are weekly rounds with specialists in rehabilitation and physical medicine. A speech therapist is occasionally consulted but training of aphatic patients is, with few exceptions, performed by the stroke team and family members.						
2. Comparator(s)	General Medical Wards: The four other medical wards at our department have no standardized program and no extra resources for the care of stroke patients. A physiotherapist and an occupational therapist are working part-time on each ward. A social worker is usually involved in the planning of future care for patients with permanent deficits.						
V Results primary outcome							
1. Effect size primary outcome		At Discharge		3 months		12 months	
		SU (n=110)	GW (n=183)	SU (n=110)	GW (n=183)	SU (n=110)	GW (n=183)
	Dead, n (%)	24 (22)	40 (22)	37 (34)	62 (34)	43 (39)	75 (41)
	Long-term hospital stay, n (%)	24 (22)	60 (33)	11 (10)	47 (26)	8 (7)	30 (16)
	Home, n (%)	59 (54)	71 (39)	62 (56)	73 (40)	59 (54)	78 (43)
	Other clinics, n (%)	3 (3)	12 (6)				
	Level of significance	p < 0.05		p < 0.001		P < 0.05	
VI Results secondary and all other outcomes							
1. Effect size secondary outcome(s)	Functional status after 1 year		SU	GMW	p		
	Activities of daily living		(n=67)	(n=108)			
	Ambulatory capacity						
	Without support		48 (72%)	59 (55%)	0.10>p>0.05		
	Technical support		10 (15%)	22 (20%)			
	Living support/wheelchair		9 (13%)	26 (24%)			
	Bedridden -		1 (1%)				
	Feeding						
	Independent 64 (96%)		101 (93%)		p>0.50		
	Partly dependent		3 (4%)	4 (4%)			

	Totally dependent	-	3 (3%)	
	Personal hygiene			
	Independent		51 (76%)	63 (58%)	p<0.05
	Partly dependent		14 (21%)	30 (28%)	
	Totally dependent		2 (3%)	15 (14%)	
	Dressing			
	Independent		54 (81%)	65 (60%)	p<0.01
	Dependent		13 (19%)	43 (40%)	
2. Effect size all other outcomes, endpoints	Duration of initial hospital stay (mean ± SD) was 21 ± 16 days for patients in the Stroke Unit and 31 ± 27 days in the General Medical Wards.			
Authors' conclusion	Essential features of the stroke unit are team work headed by a stroke nurse, staff, patient and family education and very early onset of rehabilitation. We conclude that this strategy improves functional outcome and reduces the need for long-term hospital care.			
VII Critical appraisal of study quality				
1.GRADE quality of evidence (low/moderate/high)	Low			
2. Dropouts	SU: 43 deaths (39%), GMW: 75 deaths (41%)			
3. Results critical appraisal	Randomization based on bed availability. Distribution of diagnosis types (at discharge) may differ between two groups. Not convinced the above mentioned mortality percentages are statistically significantly different (author's conclusion).			

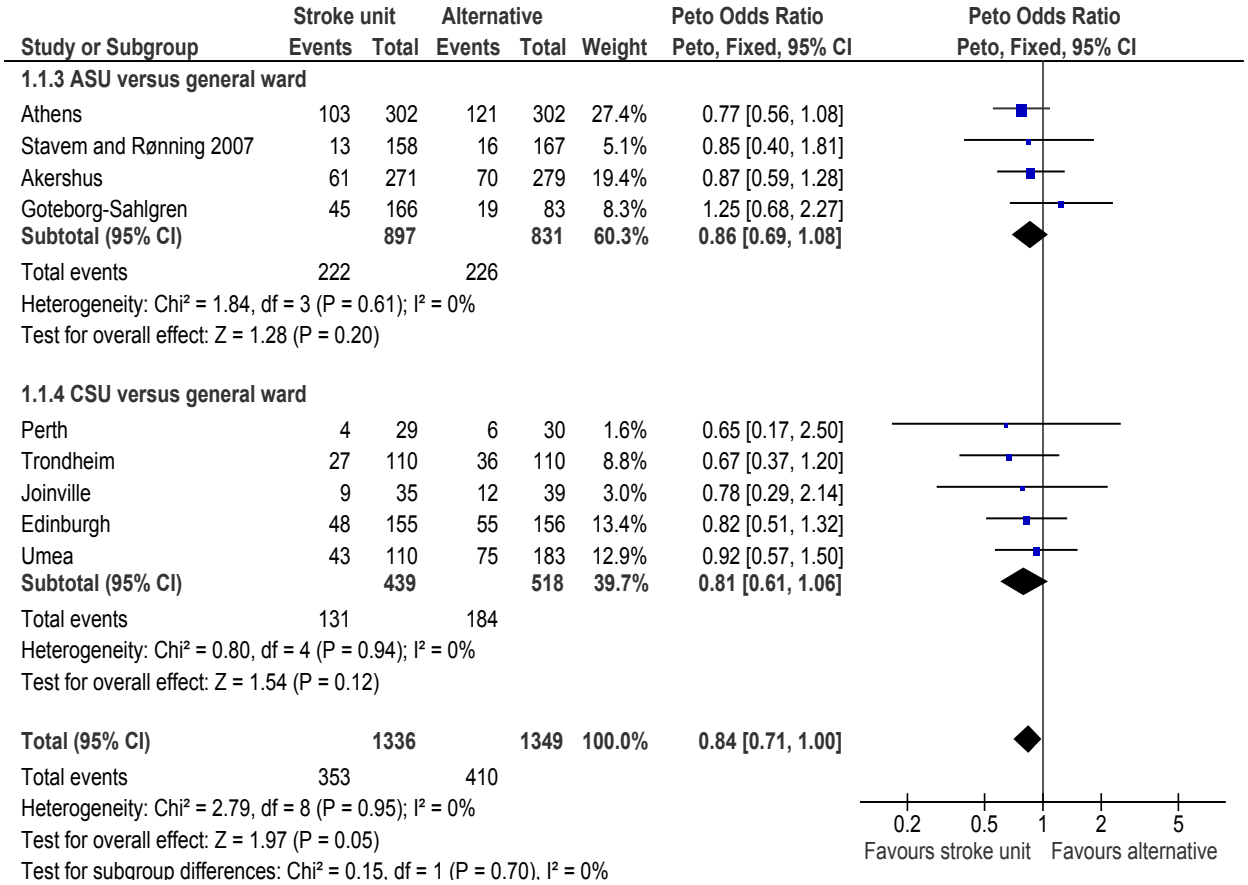
4. OVERVIEW OF ONGOING TRIALS

Registered trial number	Title	Intervention	Comparison	Completion date
NCT00792220	“Mobile Stroke-Unit” for Reduction of the Response Time in Ischemic Stroke	MSU	OCCM	December 2012
NCT00771771	Early Supported Discharge After Stroke in Bergen	Early supported discharge with day unit rehabilitation	Early supported discharge withy home rehabilitation	December 2013
NCT01382862	PHANTOM-S: The Pre-Hospital Acute Neurological Medical Care in Stroke Patients Study	Stroke emergency mobile unit	Standard practice	September 2012
ACTRN12611001243909	Establishing an effective and efficient Early Supported Discharge (ESD) rehabilitation program for Stroke clients in Perth WA	ESD rehabilitation	Standard care	
ISRCTN52416964	The Stroke Oxygen Study: a multi-centre, prospective, randomised, open, blinded-endpoint study of routine oxygen treatment in the first 72 hours after a stroke SO2S	Oxygen supplementation during the first 72 hours after randomization	No routine oxygen supplementation during the first 72 hours after randomization	November 2013

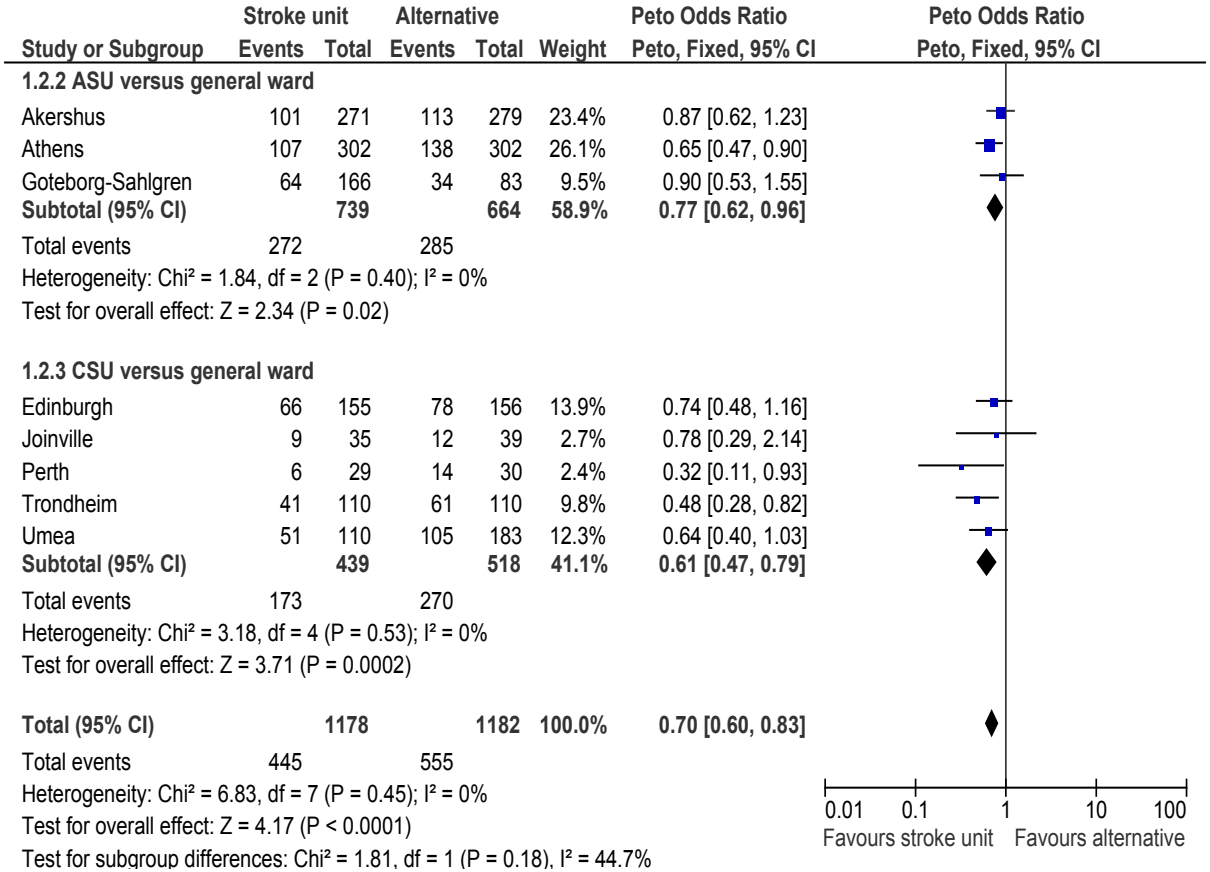
5. META-ANALYSIS

5.1. Stroke unit versus general medical ward

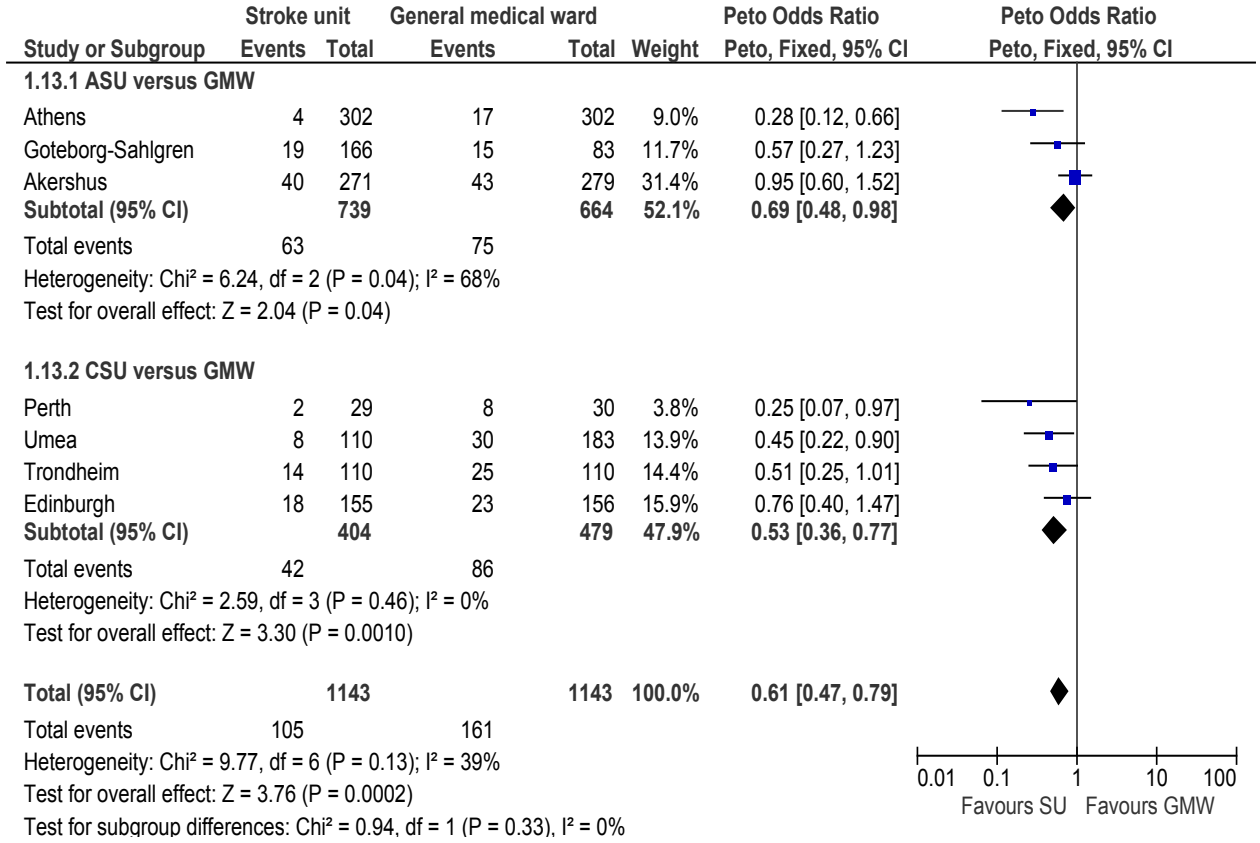
5.1.1. Outcome 1: Death by the end of scheduled follow up



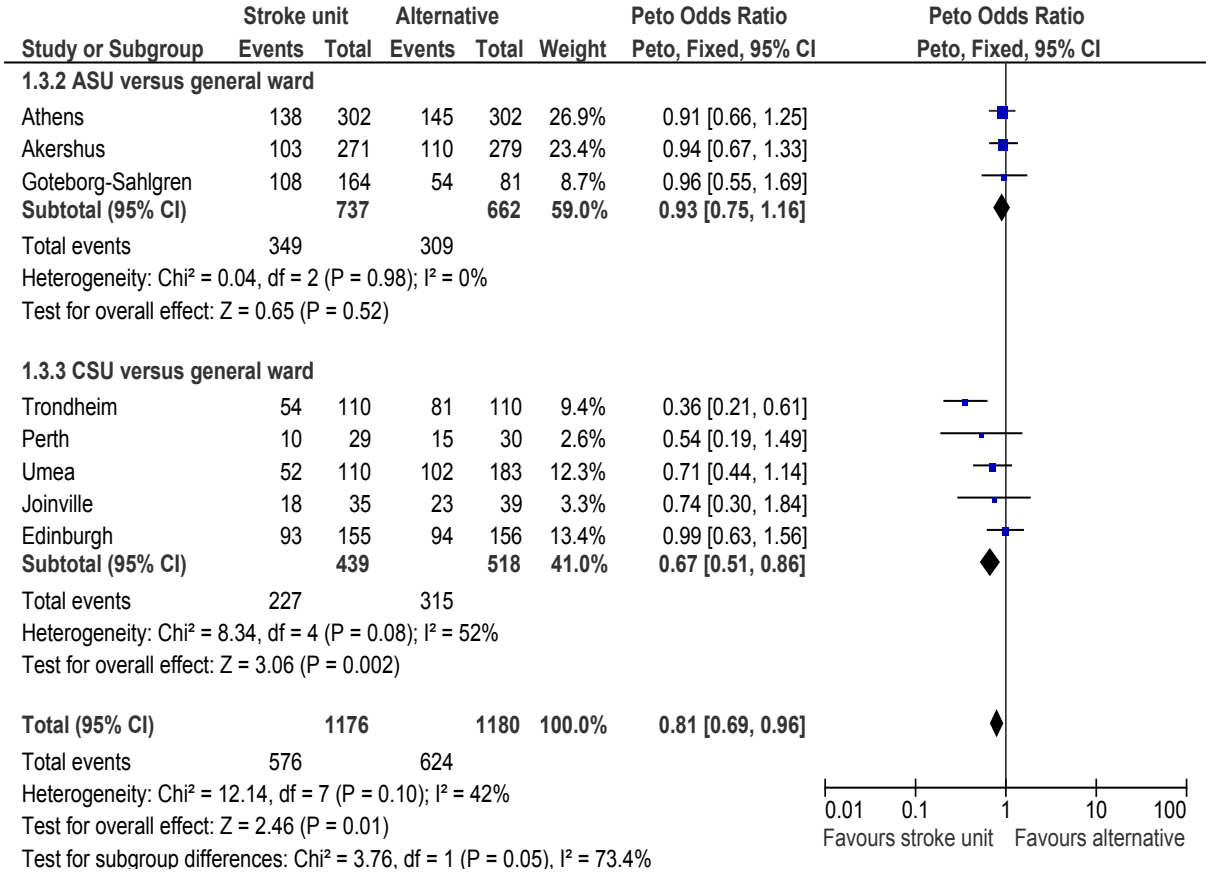
5.1.2. Outcome 2: Death or institutional care by the end of scheduled follow up



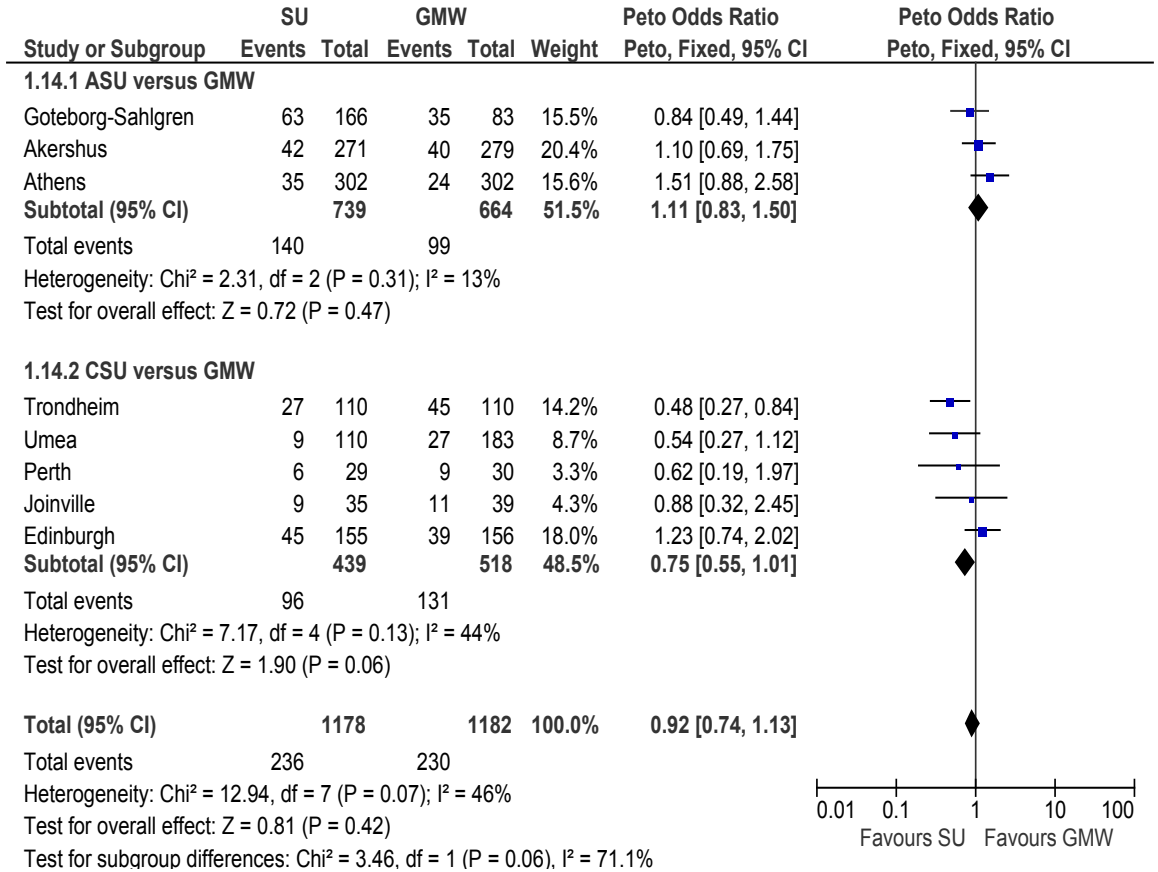
5.1.3. Outcome 3: Institutional care by the end of scheduled follow up



5.1.4. Outcome 4: Death or dependency by the end of scheduled follow up

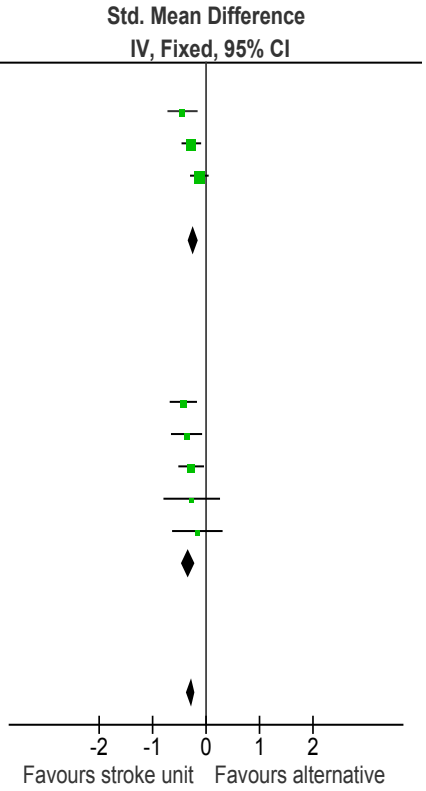


5.1.5. Outcome 5: Dependency by the end of scheduled follow up



5.1.6. Outcome 6: Length of stay (days) in a hospital or institution or both

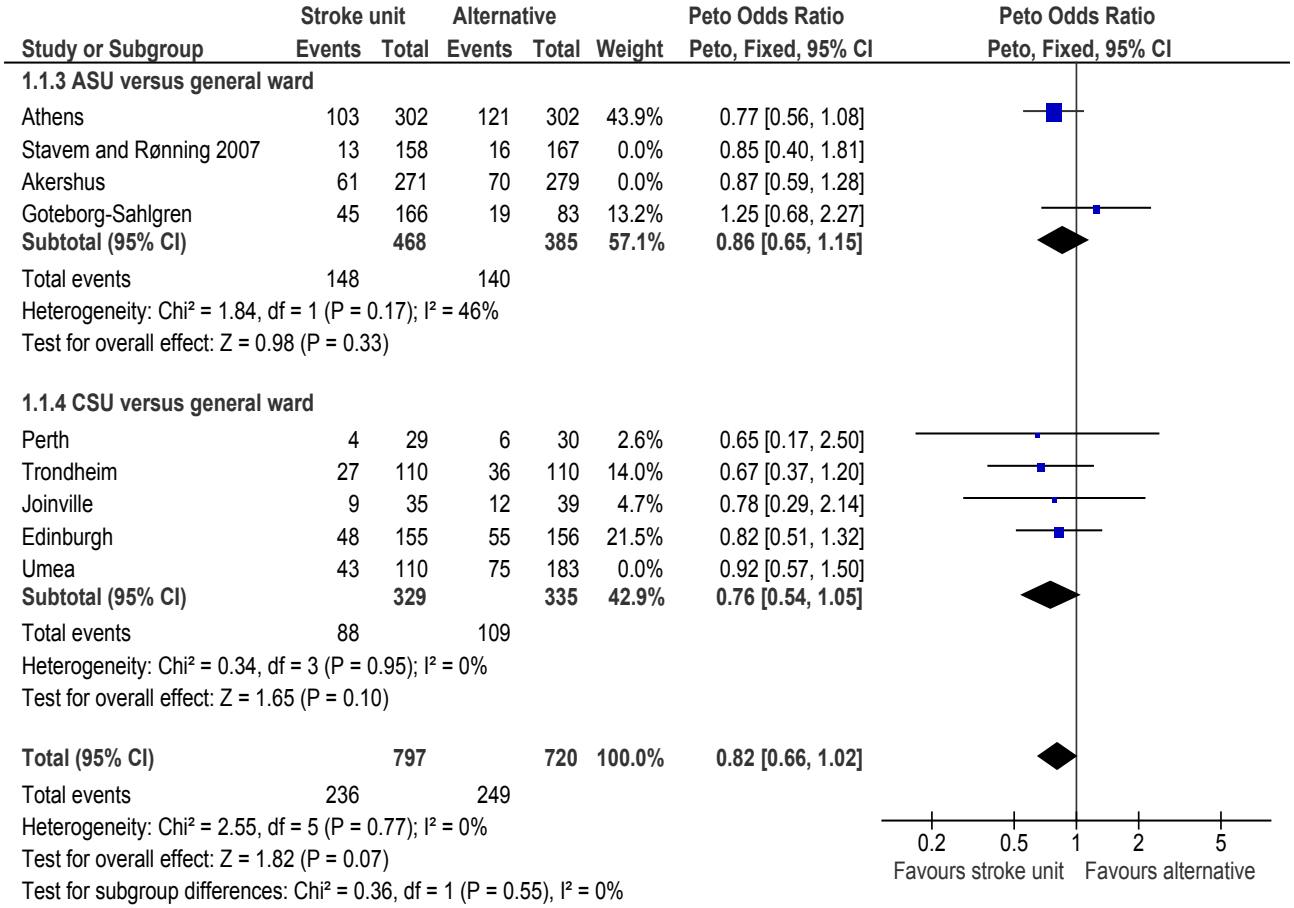
Study or Subgroup	Stroke unit Mean	SD	Total	Alternative Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI
1.4.2 ASU versus general ward								
Goteborg-Sahlgren	28.3	17	166	35.8	17	83	9.5%	-0.44 [-0.71, -0.17]
Akershus	7.7	6.2	271	9.5	6.9	279	24.0%	-0.27 [-0.44, -0.11]
Athens	11.23	6.3	302	12.1	7.49	302	26.5%	-0.13 [-0.29, 0.03]
Stavem and Rønning 2007	10	0	158	8	0	167		Not estimable
Subtotal (95% CI)			**897**			**831**	**60.0%**	**-0.23 [-0.34, -0.13]**
Heterogeneity: Chi² = 4.28, df = 2 (P = 0.12); I² = 53%								
Test for overall effect: Z = 4.33 (P < 0.0001)								
1.4.3 CSU versus general ward								
Umea	21	16	110	31	27	183	11.8%	-0.42 [-0.66, -0.19]
Trondheim	75	114.8	102	123	145.8	104	8.9%	-0.36 [-0.64, -0.09]
Edinburgh (1)	55	42.3	155	75	92.5	152	13.4%	-0.28 [-0.50, -0.05]
Perth (2)	40	49	29	53	47	30	2.6%	-0.27 [-0.78, 0.25]
Joinville	11	8.51	35	12.6	10.8	39	3.2%	-0.16 [-0.62, 0.30]
Subtotal (95% CI)			**431**			**508**	**40.0%**	**-0.33 [-0.46, -0.20]**
Heterogeneity: Chi² = 1.44, df = 4 (P = 0.84); I² = 0%								
Test for overall effect: Z = 4.98 (P < 0.00001)								
Total (95% CI)			**1328**			**1339**	**100.0%**	**-0.27 [-0.36, -0.19]**
Heterogeneity: Chi² = 6.98, df = 7 (P = 0.43); I² = 0%								
Test for overall effect: Z = 6.51 (P < 0.00001)								
Test for subgroup differences: Chi² = 1.26, df = 1 (P = 0.26), I² = 20.3%								



(1) SU: 54.5, GW: 75.1 reported in Cochrane

(2) SU: 24 (SD 30), GW: 26.7 (SD 30) reported in the Cochrane

5.1.7. Analysis on death of stroke unit versus general medical ward including RCTs only

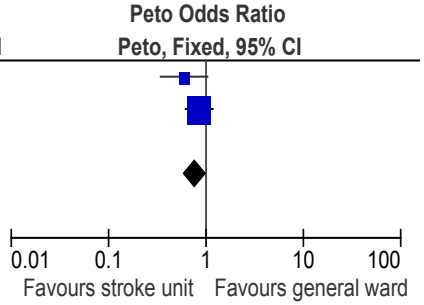


5.1.8. Long-term outcome of stroke unit versus general medical ward: 5-year analysis on mortality

Study or Subgroup	Stroke unit Events	Total	general ward Events	Total	Weight	Peto Odds Ratio Peto, Fixed, 95% CI
Trondheim	65	110	78	110	25.2%	0.60 [0.34, 1.04]
Athens	163	302	175	302	74.8%	0.85 [0.62, 1.17]
Total (95% CI)		**412**		**412**	**100.0%**	**0.78 [0.59, 1.03]**
Total events	228		253			

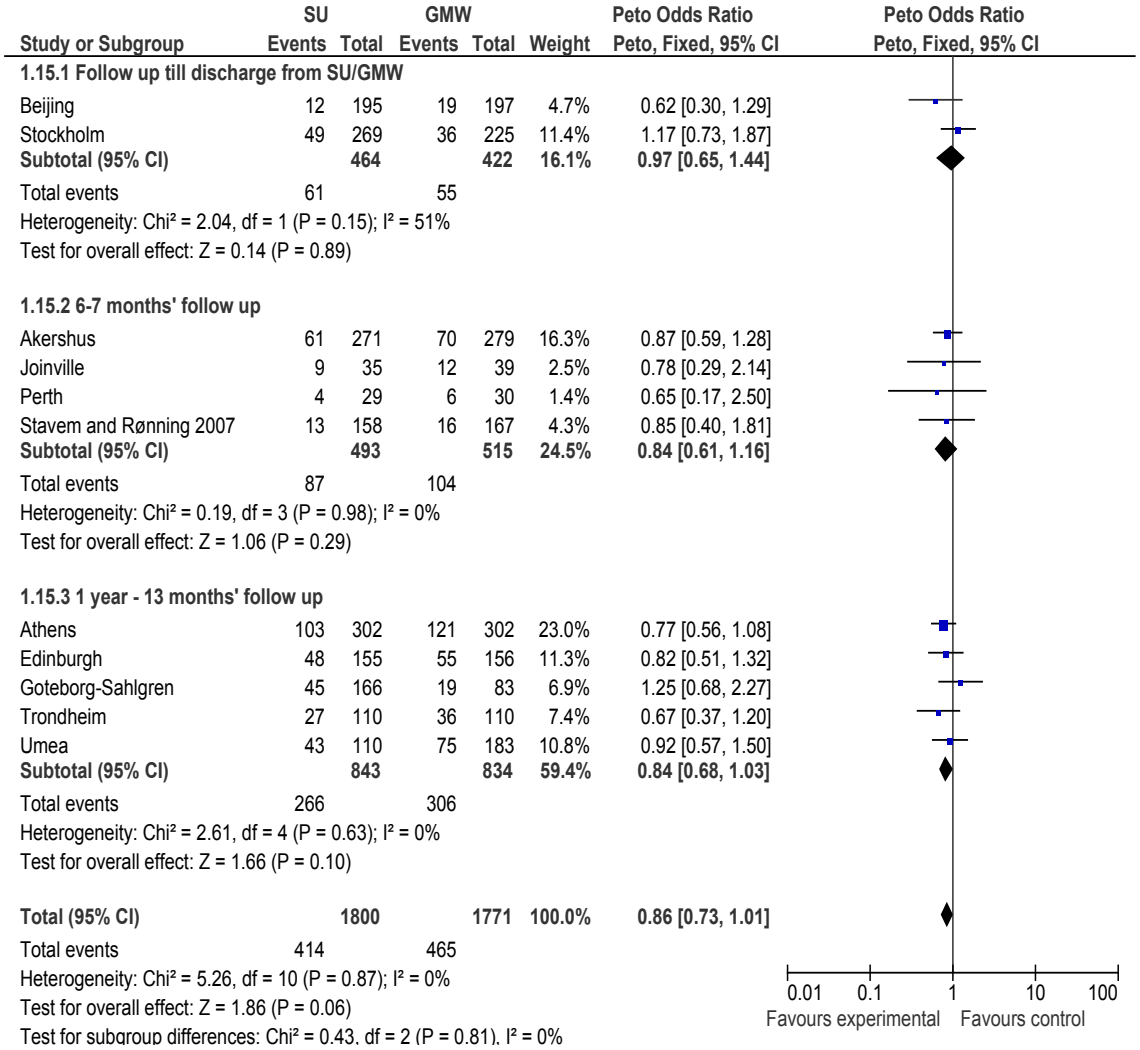
Heterogeneity: Chi² = 1.19, df = 1 (P = 0.27); I² = 16%

Test for overall effect: Z = 1.77 (P = 0.08)



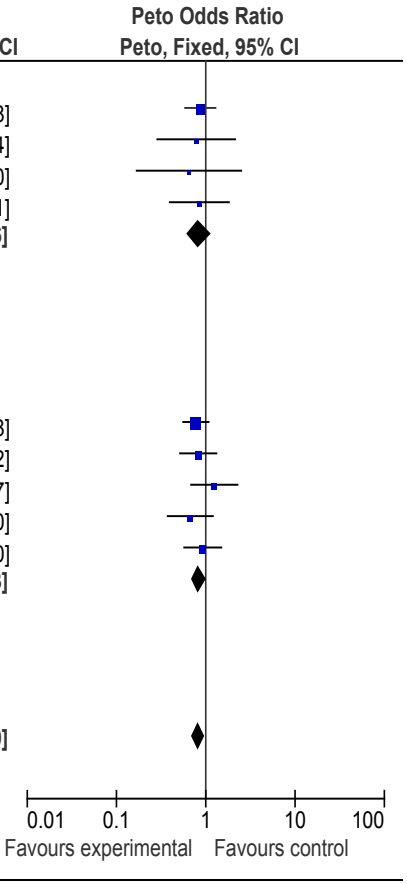
5.1.9. Subgroup analysis stratified by duration of follow up period

5.1.9.1. Outcome 1: Death by the end of scheduled follow up: no significant subgroup difference (p=0.81)

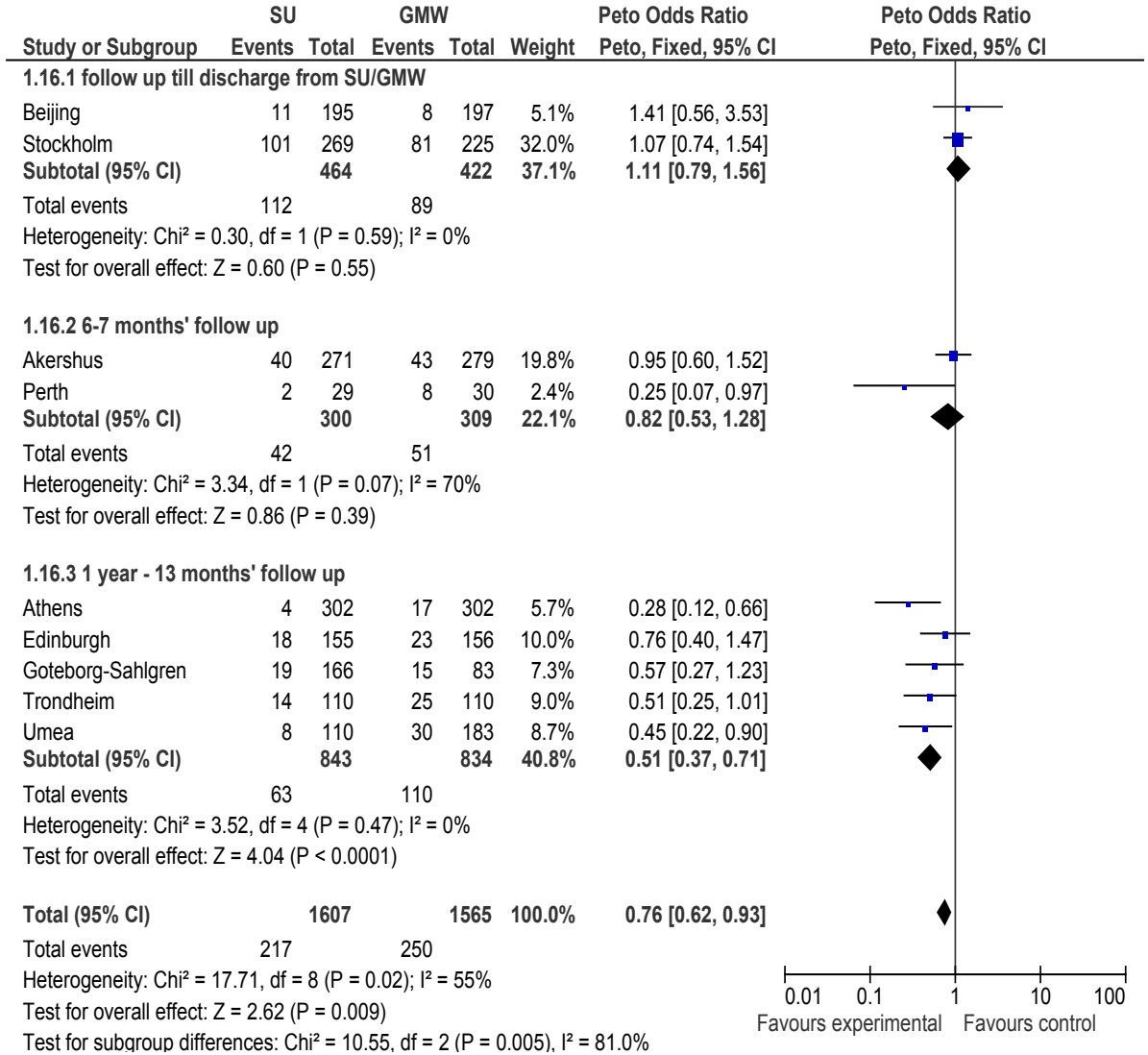


5.1.9.2. Outcome 1: Death by the end of scheduled follow up (without Beijing and Stockholm): no significant subgroup difference (P=1.00)

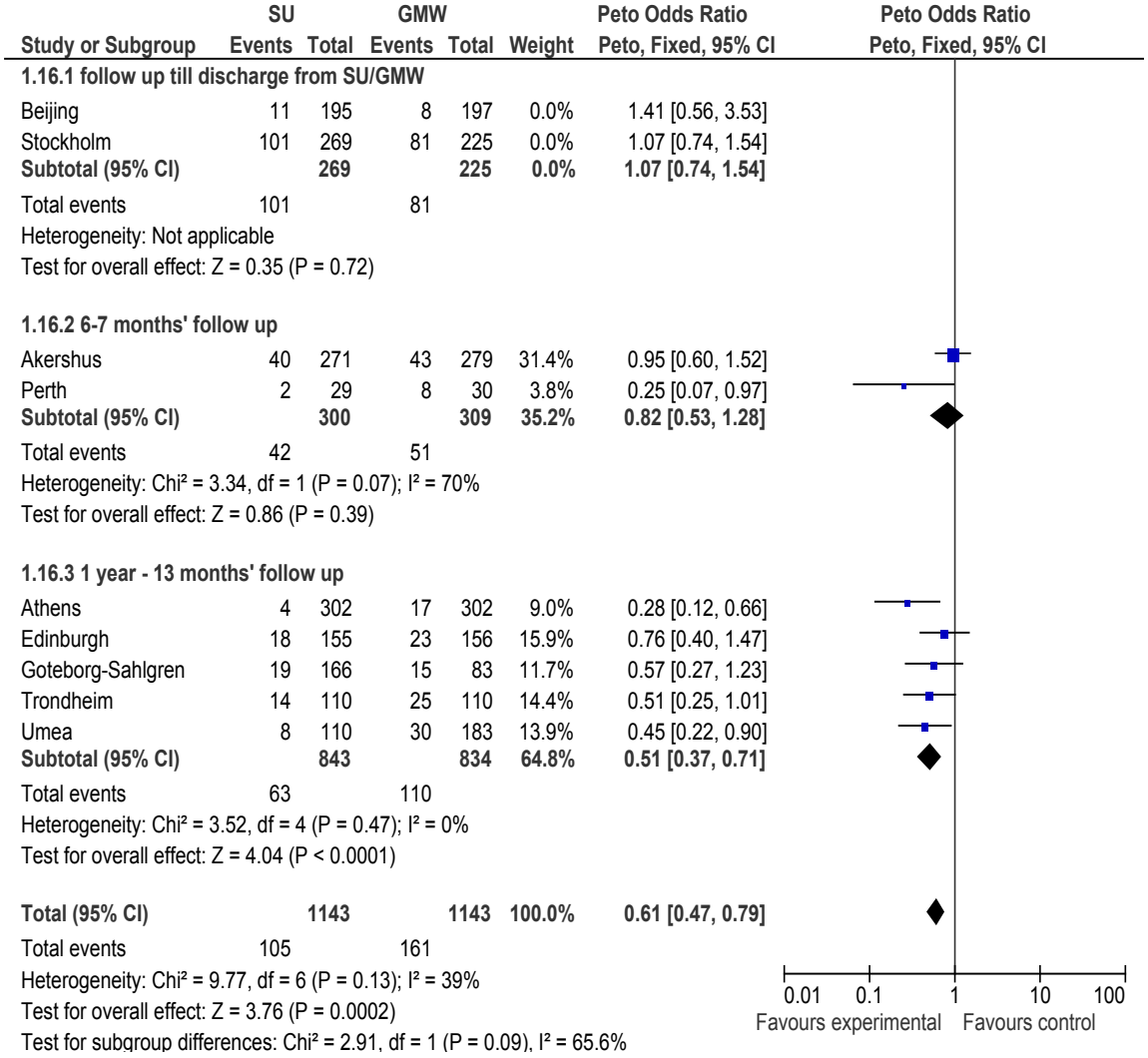
Study or Subgroup	SU Events	SU Total	GMW Events	GMW Total	Weight	Peto Odds Ratio Peto, Fixed, 95% CI
1.15.2 6-7 months' follow up						
Akershus	61	271	70	279	19.4%	0.87 [0.59, 1.28]
Joinville	9	35	12	39	3.0%	0.78 [0.29, 2.14]
Perth	4	29	6	30	1.6%	0.65 [0.17, 2.50]
Stavem and Rønning 2007	13	158	16	167	5.1%	0.85 [0.40, 1.81]
Subtotal (95% CI)		**493**		**515**	**29.2%**	**0.84 [0.61, 1.16]**
Total events	87		104			
Heterogeneity: Chi² = 0.19, df = 3 (P = 0.98); I² = 0%						
Test for overall effect: Z = 1.06 (P = 0.29)						
1.15.3 1 year - 13 months' follow up						
Athens	103	302	121	302	27.4%	0.77 [0.56, 1.08]
Edinburgh	48	155	55	156	13.4%	0.82 [0.51, 1.32]
Goteborg-Sahlgren	45	166	19	83	8.3%	1.25 [0.68, 2.27]
Trondheim	27	110	36	110	8.8%	0.67 [0.37, 1.20]
Umea	43	110	75	183	12.9%	0.92 [0.57, 1.50]
Subtotal (95% CI)		**843**		**834**	**70.8%**	**0.84 [0.68, 1.03]**
Total events	266		306			
Heterogeneity: Chi² = 2.61, df = 4 (P = 0.63); I² = 0%						
Test for overall effect: Z = 1.66 (P = 0.10)						
Total (95% CI)		**1336**		**1349**	**100.0%**	**0.84 [0.71, 1.00]**
Total events	353		410			
Heterogeneity: Chi² = 2.79, df = 8 (P = 0.95); I² = 0%						
Test for overall effect: Z = 1.97 (P = 0.05)						
Test for subgroup differences: Chi² = 0.00, df = 1 (P = 1.00), I² = 0%						



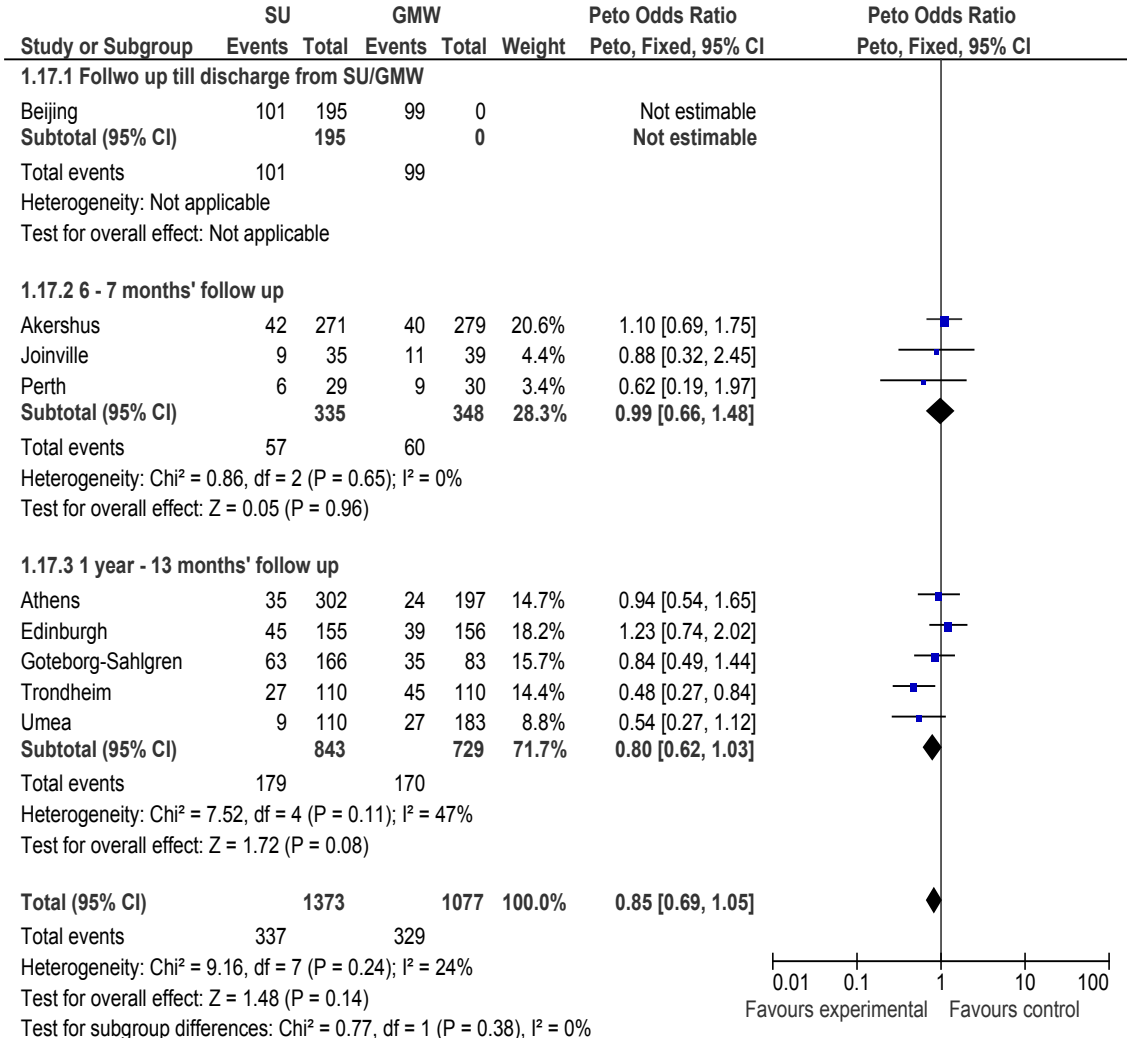
5.1.9.3. Outcome 2: Institutional care by the end of scheduled follow up: significant subgroup difference (P=0.005)



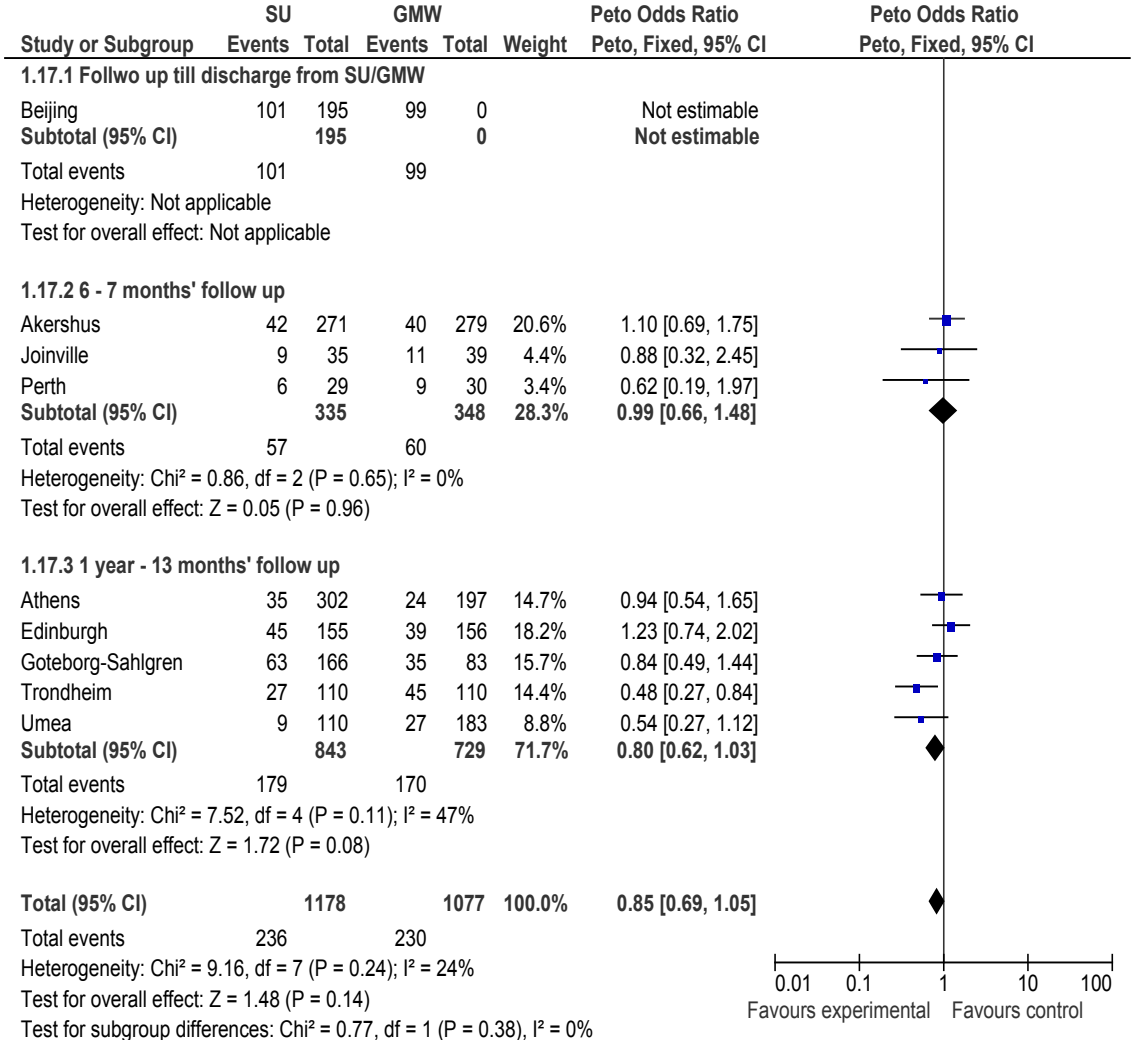
5.1.9.4. *Outcome 2: Institutional care by the end of scheduled follow up (excluding Beijing and Stockholm): no significant subgroup difference (P=0.09)*



5.1.9.5. Outcome 3: Dependency by the end of scheduled follow up: No significant subgroup difference (P=0.38)

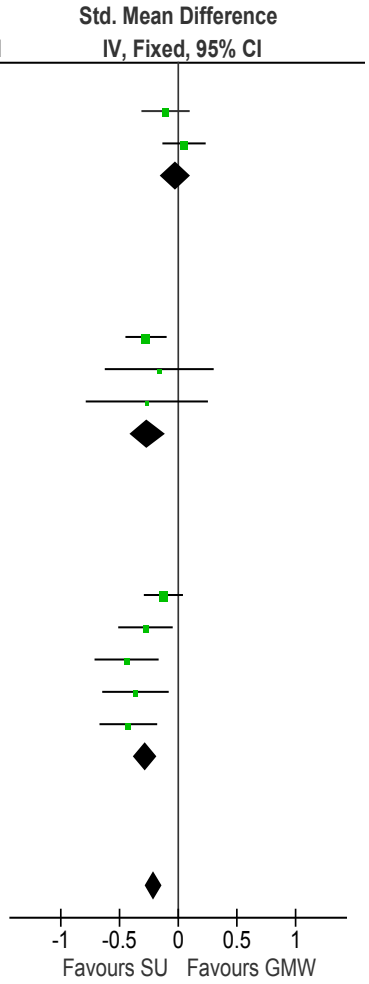


5.1.9.6. Outcome 3: Dependency by the end of scheduled follow up (excluding Beijing and Stockholm): no significant subgroup difference (P=0.38)

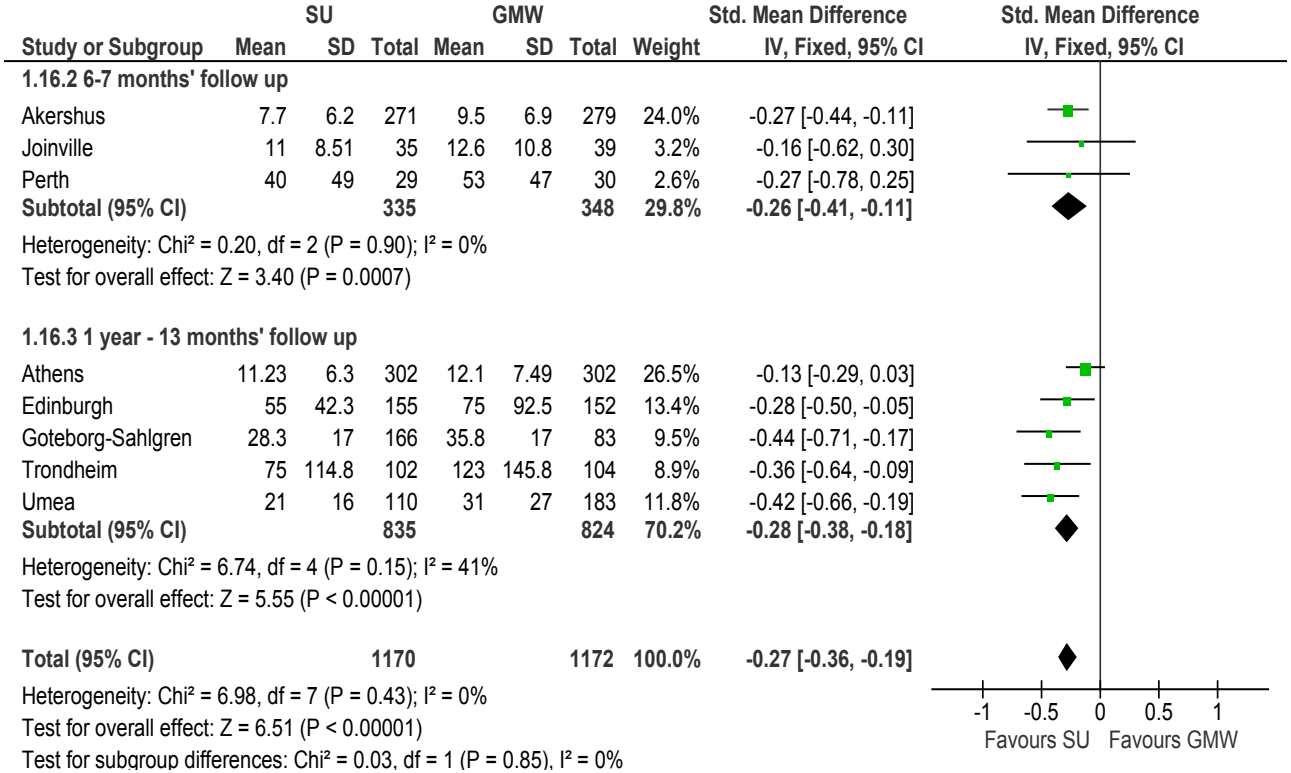


5.1.9.7. Outcome 4: Length of stay in a hospital or institution: significant subgroup difference (P=0.006)

Study or Subgroup	SU Mean	SU SD	SU Total	GMW Mean	GMW SD	GMW Total	Weight	Std. Mean Difference IV, Fixed, 95% CI
1.16.1 Follow up till discharge from SU/GMW								
Beijing	20.6	10.4	195	22.3	19.7	197	12.4%	-0.11 [-0.31, 0.09]
Stockholm	21	20	269	20	20	225	15.5%	0.05 [-0.13, 0.23]
Subtotal (95% CI)			**464**			**422**	**28.0%**	**-0.02 [-0.15, 0.11]**
Heterogeneity: Chi² = 1.35, df = 1 (P = 0.25); I² = 26%								
Test for overall effect: Z = 0.30 (P = 0.77)								
1.16.2 6-7 months' follow up								
Akershus	7.7	6.2	271	9.5	6.9	279	17.3%	-0.27 [-0.44, -0.11]
Joinville	11	8.51	35	12.6	10.8	39	2.3%	-0.16 [-0.62, 0.30]
Perth	40	49	29	53	47	30	1.9%	-0.27 [-0.78, 0.25]
Subtotal (95% CI)			**335**			**348**	**21.5%**	**-0.26 [-0.41, -0.11]**
Heterogeneity: Chi² = 0.20, df = 2 (P = 0.90); I² = 0%								
Test for overall effect: Z = 3.40 (P = 0.0007)								
1.16.3 1 year - 13 months' follow up								
Athens	11.23	6.3	302	12.1	7.49	302	19.1%	-0.13 [-0.29, 0.03]
Edinburgh	55	42.3	155	75	92.5	152	9.6%	-0.28 [-0.50, -0.05]
Goteborg-Sahlgren	28.3	17	166	35.8	17	83	6.9%	-0.44 [-0.71, -0.17]
Trondheim	75	114.8	102	123	145.8	104	6.4%	-0.36 [-0.64, -0.09]
Umea	21	16	110	31	27	183	8.5%	-0.42 [-0.66, -0.19]
Subtotal (95% CI)			**835**			**824**	**50.6%**	**-0.28 [-0.38, -0.18]**
Heterogeneity: Chi² = 6.74, df = 4 (P = 0.15); I² = 41%								
Test for overall effect: Z = 5.55 (P < 0.00001)								
Total (95% CI)			**1634**			**1594**	**100.0%**	**-0.20 [-0.27, -0.13]**
Heterogeneity: Chi² = 18.49, df = 9 (P = 0.03); I² = 51%								
Test for overall effect: Z = 5.68 (P < 0.00001)								
Test for subgroup differences: Chi² = 10.20, df = 2 (P = 0.006), I² = 80.4%								



5.1.9.8. Outcome 4: Length of stay (days) in a hospital or institution or both (excluding Beijing and Stockholm): No significant subgroup difference (P=0.85)

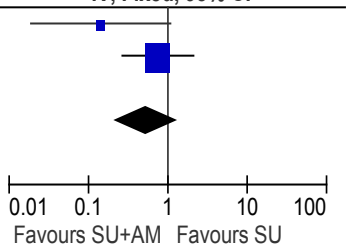


5.2. Meta-analysis: stroke unit with continuous monitoring versus conventional stroke unit

5.2.1. Outcome 1: Death by the end of scheduled follow up

Study or Subgroup	SU+AM Events	SU+AM Total	SU Events	SU Total	Weight	Risk Ratio IV, Fixed, 95% CI
Groningen	1	27	7	27	20.6%	0.14 [0.02, 1.08]
Pavia	6	134	8	134	79.4%	0.75 [0.27, 2.10]
Total (95% CI)		**161**		**161**	**100.0%**	**0.53 [0.21, 1.34]**
Total events	7		15			

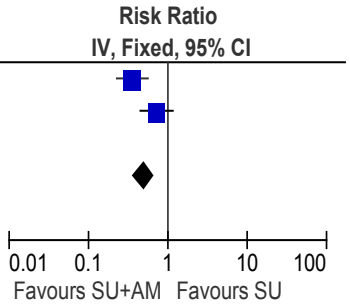
Heterogeneity: Chi² = 2.04, df = 1 (P = 0.15); I² = 51%
Test for overall effect: Z = 1.34 (P = 0.18)



5.2.2. Outcome 2: Death or institutional care by the end of scheduled follow up

Study or Subgroup	SU+AM Events	SU+AM Total	SU Events	SU Total	Weight	Risk Ratio IV, Fixed, 95% CI
Pavia (1)	20	134	56	134	52.5%	0.36 [0.23, 0.56]
Groningen	13	27	18	27	47.5%	0.72 [0.45, 1.16]
Total (95% CI)		**161**		**161**	**100.0%**	**0.50 [0.36, 0.69]**
Total events	33		74			

Heterogeneity: Chi² = 4.45, df = 1 (P = 0.03); I² = 78%
Test for overall effect: Z = 4.17 (P < 0.0001)

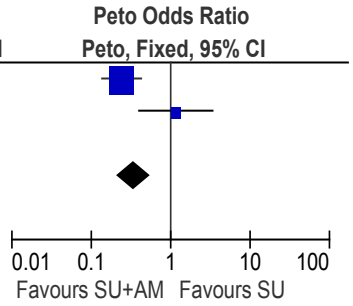


(1) Different figures reported by trial and by Cochrane review

5.2.3. Outcome 3: Institutional care by the end of scheduled follow up

Study or Subgroup	SU+AM Events	SU+AM Total	SU Events	SU Total	Weight	Peto Odds Ratio Peto, Fixed, 95% CI
Pavia	14	134	48	134	78.0%	0.24 [0.14, 0.43]
Groningen	12	27	11	27	22.0%	1.16 [0.40, 3.38]
Total (95% CI)		**161**		**161**	**100.0%**	**0.34 [0.21, 0.56]**
Total events	26		59			

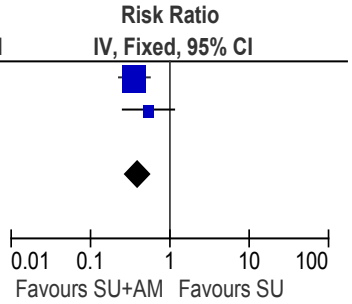
Heterogeneity: Chi² = 6.47, df = 1 (P = 0.01); I² = 85%
Test for overall effect: Z = 4.22 (P < 0.0001)



5.2.4. Outcome 4: Death or dependency by the end of scheduled follow up

Study or Subgroup	SU+AM Events	SU+AM Total	SU Events	SU Total	Weight	Risk Ratio IV, Fixed, 95% CI
Pavia	20	134	56	134	73.4%	0.36 [0.23, 0.56]
Groningen	7	27	13	27	26.6%	0.54 [0.25, 1.14]
Total (95% CI)		**161**		**161**	**100.0%**	**0.40 [0.27, 0.59]**
Total events	27		69			

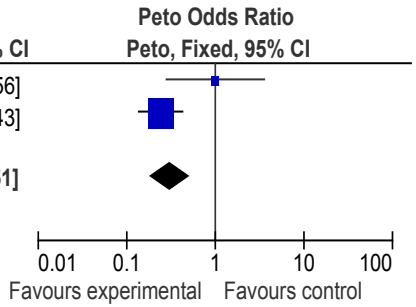
Heterogeneity: Chi² = 0.85, df = 1 (P = 0.36); I² = 0%
Test for overall effect: Z = 4.67 (P < 0.00001)



5.2.5. Outcome 5: dependency by the end of scheduled follow up

Study or Subgroup	SU+AM Events	SU+AM Total	SU Events	SU Total	Weight	Peto Odds Ratio Peto, Fixed, 95% CI
Groningen	6	27	6	27	16.6%	1.00 [0.28, 3.56]
Pavia	14	134	48	134	83.4%	0.24 [0.14, 0.43]
Total (95% CI)		**161**		**161**	**100.0%**	**0.31 [0.18, 0.51]**
Total events	20		54			

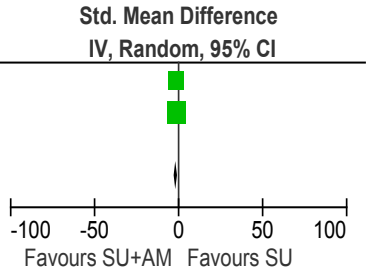
Heterogeneity: Chi² = 4.01, df = 1 (P = 0.05); I² = 75%
Test for overall effect: Z = 4.49 (P < 0.00001)



5.2.6. Outcome 6: Length of stay (days) in a hospital or institution or both

	SU+AM			SU				Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI
Groningen	16	5	27	27	7	27	43.7%	-1.78 [-2.42, -1.14]
Pavia (1)	9.2	4.9	134	17.1	10.8	134	56.3%	-0.94 [-1.19, -0.69]
Total (95% CI)			**161**			**161**	**100.0%**	**-1.31 [-2.13, -0.49]**

Heterogeneity: Tau² = 0.29; Chi² = 5.80, df = 1 (P = 0.02); I² = 83%
Test for overall effect: Z = 3.13 (P = 0.002)



(1) SD came from the Cochrane review

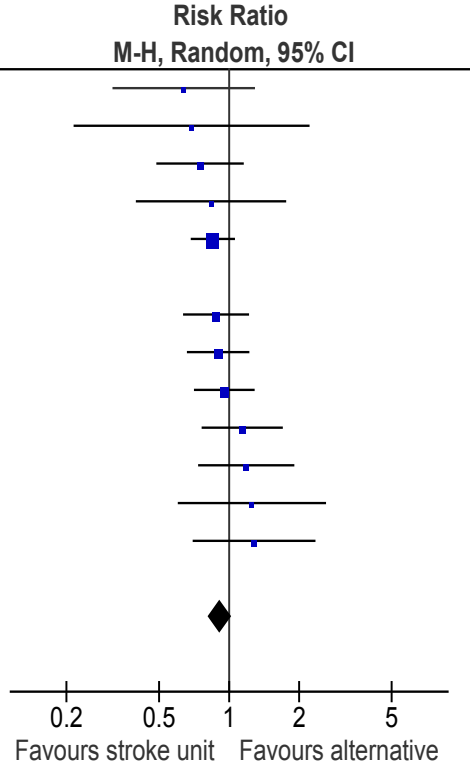
5.3. Meta-analysis result including Goteborg-Ostra and Svendborg

(unpublished trials reported by the Cochrane review and Norwegian HTA report)

	Stroke unit		Alternative			Risk Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI
Beijing	12	195	19	197	2.5%	0.64 [0.32, 1.28]
Perth	4	29	6	30	0.9%	0.69 [0.22, 2.19]
Trondheim	27	110	36	110	6.8%	0.75 [0.49, 1.15]
Joinville	9	35	12	39	2.3%	0.84 [0.40, 1.74]
Athens	103	302	121	302	28.0%	0.85 [0.69, 1.05]
Stavem and Rønning 2007	13	158	16	167	0.0%	0.86 [0.43, 1.73]
Edinburgh	48	155	55	156	12.2%	0.88 [0.64, 1.21]
Akershus	61	271	70	279	13.6%	0.90 [0.66, 1.21]
Umea	43	110	75	183	14.4%	0.95 [0.71, 1.28]
Stockholm	49	269	36	225	7.9%	1.14 [0.77, 1.69]
Goteborg-Sahlgren	45	166	19	83	5.6%	1.18 [0.74, 1.89]
Goteborg-Ostra	16	215	12	202	2.3%	1.25 [0.61, 2.58]
Svendborg	14	31	12	34	3.4%	1.28 [0.70, 2.33]
Total (95% CI)		**1888**		**1840**	**100.0%**	**0.92 [0.82, 1.02]**
Total events	431		473			

Heterogeneity: Tau² = 0.00; Chi² = 7.09, df = 11 (P = 0.79); I² = 0%

Test for overall effect: Z = 1.55 (P = 0.12)



6. QUALITY INDICATORS: DATABASES

- Acute stroke services framework 2008. Melbourne VIC: National Stroke Foundation; 2008. 37 p.
- Canadian Stroke Strategy Core Performance Indicator Update 2010. CSS Information & Evaluation Working Group. June 2010.
- Development and Implementation of Evidence-Based Indicators for Measuring Quality of Acute Stroke Care. Heuschmann et al. The Quality Indicator Board of the German Stroke Registers Study Group (ADSR). Stroke. 2006; 37: 2573-2551
- Diagnosis and treatment of ischemic stroke. Institute for Clinical Systems Improvement (ICSI). Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2010 Jun. 70 p.
- National Outcomes Measurement System: Adults in health care speech-language pathology user's guide. National Center for Evidence-Based Practice in Communication Disorders. Rockville (MD): American Speech-Language-Hearing Association; 2003. 53 p.
- Présentation du thème « Prise en charge initiale de l'accident vasculaire cérébral. HAS. Available at: http://www.has-sante.fr/portail/upload/docs/application/pdf/2012-03/ipaqss_fiche_avc_20120309.pdf
- Quality and outcomes framework guidance for GMS contract 2009/10. British Medical Association (BMA) and NHS Employers. London (UK): British Medical Association, National Health Service Confederation; 2009 Mar. 162 p.
- Quality of In-Hospital Stroke Care According to Evidence-Based Performance Measures. Results From the First Audit of Stroke, Catalonia (Spain) 2005/2006. Stroke. 2009;40:1433-1439
- Sentinel Stroke Audit. NHS UK/Royal College of Physicians
- Specifications manual for national hospital inpatient quality measures, version 3.1a. Centers for Medicare & Medicaid Services (CMS), The Joint Commission; 2010 Apr 1. various p.
- Stroke and stroke rehabilitation physician performance measurement set. Chicago (IL): American Medical Association (AMA), National Committee for Quality Assurance (NCQA); 2009 Feb. 20 p.
- Stroke Performance Measure Set following harmonization of measure specifications with the Paul Coverdell National Acute Stroke Registry and American Heart Association / American Stroke Association GET WITH THE GUIDELINES, and after endorsement by NQF
- Systematic review of process indicators: including early rehabilitation interventions used to measure quality of acute stroke care. Purvis et al. International Journal of Stroke Vol 4, April 2009, 72–80
- The Danish National Indicator Project http://www.nip.dk/
- Variations in Quality Indicators of Acute Stroke Care in 6 European Countries: The European Implementation Score (EIS) Collaboration. Wiedmann et al. Stroke. 2012;43:00-00.

7. QUALITY INDICATORS: DESCRIPTION OF THE STUDIES

A full data extraction sheet with all quality indicators identified in the literature is available in a separate document

(https://kce.fgov.be/sites/default/files/page_documents/KCE_181S_Full_data_%20extraction%20sheet_7_1.xlsx)

7.1. Structure indicators : training of medical staff and multidisciplinary stroke team

The systematic review performed by Langhorne et al analysed the components of effective stroke units[1].

- All units (N=11) described a core multidisciplinary team of medical, nursing physiotherapy, occupational therapy and speech and language therapy staff.
- The majority (7/11) also reported social work input.
- All units described educational and training programmes for staff : regular seminars on stroke care, workshops and training days several times per year.
- The staffing levels must be interpreted with considerable caution as different methods of measurement were used in different settings and there were variable levels of cross-over with other non-stroke services (e.g. general neurology, geriatric rehabilitation).

7.2. Process indicators

7.2.1. Studies on quality indicators for process: hyperacute phase

- Initial neurological assessment

Evans et al. performed a randomized controlled trial on 304 patients to compare the difference in management process in stroke unit and general medical ward (care provided by a specialist stroke team)[2]Statistical analysis revealed that initial neurological assessments significantly varied between stroke units and stroke teams e.g. record of the initial assessment of consciousness (P=0.001), eye movements (P=0.0001), communication (P=0.0004). Differences were not significant for visual fields (P=0.53), sensation (P=0.13), visual/sensory inattention (P=0.39) and cognitive function (P=1.00).

- Brain imaging

A Cochrane review[3] investigated the diagnostic accuracy of diffusion-weighted magnetic resonance imaging (DWI) and CT scan for acute ischemic stroke. DWI appeared to be more sensitive than CT for early detection of ischemic stroke, although the generalisability of the result is limited by the validity of included trials.

CT scanning is one of the components of well performing stroke units in a systematic review by Langhorne et al[1]. Another systematic review by the same author [4] confirmed this finding, based on a comparison between performance of mobile stroke teams and comprehensive stroke units. In this review, stroke patients treated by mobile stroke teams were found significantly less likely to survive (P<0.01), return home (P<0.001) or regain independence (P<0.0001), compared to those treated in a comprehensive stroke unit. Use of CT scan significantly varied between mobile stroke team and comprehensive stroke unit.

Another randomized controlled trial also concluded that a significantly greater proportion of patients in the stroke unit (86%) than the general ward (48%, P=0.001) had a CT scan within 48 hours (the standard recommended by UK National Guidelines for Stroke Care)[2].

- Thrombolytic therapy

A Cochrane review on thrombolysis for acute ischemic stroke[5] identified a reduced risk of a composite endpoint (death or dependency) at three to six months after stroke with early thrombolytic therapy, up to six hours after stroke (odds ratio of 0.81; 95% CI 0.73 to 0.90). The authors concluded that this overall [2]Another meta-analysis[6] pooled the trials on stroke patients treated in 3- and 4.5-hour time window to determine the efficacy of tissue plasminogen activator (t-PA). The results show that tPA treatment was associated with an increased chance of favorable outcome (odds ratio 1.31; 95% CI: 1.10 to 1.56; P=0.002) . There was no significant difference in mortality (odds ratio 1.04; 95% CI: 0.75 to 1.43; P=0.83) compared to placebo treated patients.

the Cochrane review also compared the effects of treatment given within 3 hours versus after 3 hours, The effect on death or dependency of these two time windows were not statistically different (P for subgroup difference =0.09), but the dominant benefit of thrombolysis compared to control no longer sustained once the time window was restricted to after 3 hours. For treatment given within 3 hours, the odds ratio (compared to control) was 0.71 (95%CI 0.52, 0.96) with a significant P value (P=0.027). After 3 hours, the odds ratio increased to 0.95 (95%CI 0.82, 1.10) and the P value was not significant (P=0.49).

- Dysphasia and dysphagia screening

Recorded swallowing assessment was one of the differentiators (P<0.0001 for between-group difference) between comprehensive stroke unit and mobile stroke team in the systematic review performed by Langhorne et al., where the treatment in a stroke unit significantly (P<0.01) increased the chance of survival, return home and regaining independence[4].

Another systematic review[7] cited the figures from a prospective study related to the impact of dysphasia on patient outcome. Unfavorable results of the Bedside Swallowing Assessment were associated with significantly longer hospital stay (P < 0.01), higher mortality independent of confounding variables (P= 0.01); lower Barthel Index at 6 months (P < 0.02), greater likelihood of discharge to institutional care (P < 0.05)[93].

In a controlled trial (N=306)[8], acute stroke patients with dysphasia (N=204) were randomly assigned to either usual care or a group with standard low-intensity intervention, comprising swallowing compensation strategies and diet prescription three times weekly for up to a month. After 6 months, standard swallowing therapy was associated with a non-significant trend toward a reduction in death (0.80, 0.5-1.3), institutionalisation (0.69, 0.4-1.1), and dependency (1.05, 0.8-1.3); a significant reduction in swallowing-related medical complications (0.73, 0.6-0.9), chest infection (0.56, 0.4-0.8), and the composite outcome death or institutionalisation (0.73, 0.55-0.97); a significant rise in the proportion of patients regaining swallowing function (1.41, 1.03-1.94).

Another randomized controlled trial[2] found that initial assessment on swallowing was significantly more commonly recorded in stroke units than in general medical wards (P<0.0004). The dependency outcome was significantly associated with measures to prevent aspiration and early feeding.

- Glycemia

Only one randomized controlled trial mentioned the initial assessment on blood glucose: hyperglycemia assessment was significantly more commonly performed in stroke units than in general medical wards (P=0.002).

7.2.2. Studies on Early acute management (24 – 48 hours after stroke onset)

- Admission in a stroke unit

The evidence on the admission in a stroke unit was the topic of the first part of this report.

- Early antiplatelet therapy

A Cochrane review[43] investigated antiplatelet therapy for acute ischemic stroke. The analysis included nine trials (N=41,399). Early antiplatelet therapy resulted in a significant decrease in death or dependency at the end of follow-up (OR = 0.94; 95% CI 0.91 to 0.98).

Furthermore, this treatment increased the odds of complete recovery after stroke (OR = 1.06; 95% CI 1.01 to 1.11).

- Early mobilization

Early mobilization/rehabilitation is the most frequently cited QI during this phase of care. Langhorne et al. conducted 2 systematic reviews on this topic[44, 45]. The first one found that early mobilization is a common feature (67-100% units) of effective stroke units. The second one found significantly greater proportions of stroke unit patients with occupational therapy assessment in comparison with those treated by a mobile stroke team (P<0.0001). This difference might explain the better outcomes after stroke units (i.e. survival, return home, independence).

A third systematic review addressed the issue of occupational therapy from the perspective of long-term rehabilitation. The evidence supported a client-centered approach and the use of everyday life occupations in occupational therapy[9].

A Cochrane review[10] assessed the effectiveness of occupational therapy interventions that focus specifically on daily living activities for patients with specific problems in this area. The authors conclude that occupational therapy is effective to improve the personal competences in everyday activities after stroke.

Another Cochrane review[11] on very early versus delayed mobilization after stroke only identified and included one trial (N=71). Death and level of diability were lower in the intervention group at three months, but the difference was not statistically significant (odds ratio : 0.67, 95% confidence interval 0.25 to 1.79, P = 0.42).

A randomized controlled trial investigated the reasons to explain the beneficial outcome with stroke units. The statistical analysis indicated a significantly greater proportion of patients with occupational therapy assessment in stroke units within 7 days of admission, compared to those treated in general medical wards (P=0.0008). In contrast, the amount of rehabilitation assessment within 7 days (P=0.41) and physiotherapy assessment with 72 hours (P=0.16) did not differ between both settings.

7.2.3. Studies on inpatient care (after 48 hours of stroke onset)

- Vascular imaging, electrocardiogram and inpatient assessment

One randomized controlled trial compared these 3 interventions in stroke units and general medical wards. Carotid duplex scanning was undertaken 5.6 (P5% CI 3.1-5.7) days earlier in patients managed in stroke unit (mean 5.2 days [SD 4.4]) than those managed in general medical wards (mean 9.6 days [SD 6.7]). A significantly greater proportion of patients managed in stroke unit had an ECG recorded on admission, compared to patients in general medical wards (P=0.03). Finally, management of hypertension, hyperglycemia and hydration were comparable between both settings but a higher proportion of patients in stroke units received oxygen, antipyretics, anti-aspiration measures and early nutrition. The amount of neurological monitoring also differed significantly between groups[2].

- Electrocardiogram (ECG)

One systematic review[1] also reported ECG as one of the common features of effective stroke units.

- Management and use of evidence-based protocols

One recent trial (N=1009)[29] provided promising evidence for the implementation of evidence-based protocols for the management of fever, hyperglycemia and swallowing dysfunction in stroke units.

In 2002, the systematic review by Langhorne et al. already summarized effective components of stroke units throughout the whole period of inpatient care: careful fluid management, antibiotics for suspected infection, careful positioning, as well as handling, bowel and bladder care[1].

7.2.4. Studies on interventions at discharge

- Discharge care plan, patient/carer eduation and rehabilitation goal setting

The systematic review from Langhorne et al[1] found a variety of approaches to discharge planning described by effective stroke units. Most units (9/11) made early contact with patients and carers to make appropriate comprehensive assessment for hospital discharge. A miniority (4/11) reported a pre-discharge home visit or follow-up from a stroke liaison nurse.

One RCT designed to explore reasons to explain beneficial outcomes related to stroke unit found the following elements: written evidence of rehabilitation goals (P=0.003), assessment of caregiver skill needs (P=0.0001), social work assessment within 7 days (P=0.02), information to patients/caregivers on discharge/rehabilitation plans (P=0.03).[2]

Another randomized controlled trial[97] evaluated the effectiveness of a self-management program (changes in health behaviors, health status and health service utilization) for chronic disease, including 952 patients diagnosed e.g. with stroke. The programme produced improvement at six months: weekly minutes of exercise, frequency of cognitive symptom management, communication with physicians, self-reported health, health distress, fatigue, disability, and social/role activities limitations. The intervention group had also fewer hospitalizations and days in the hospital.

- Anticoagulation for AF

Anticoagulant for atrial fibrillation is the most frequently cited indicator at discharge care. The RCT by Evans et al.[2] showed that a greater proportion of patients in stroke units with atrial fibrillation received anticoagulation, compared to those managed in general medical wards (P=0.03).

- Antihypertensive agent

Nazir et al performed two RCTs on the effect of antihypertensive agents:

  - The first one (24 hypertensive patients 2-7 days after stroke)[12] concluded that losartan was generally well tolerated, no patient had a deterioration in neurological function and a significant reduction in MABP was observed (P=0.0001).
  - The second one (25 normotensive patients) concluded[12] that perindopril was safe and efficacious when introduced in the first week after mild ischaemic stroke.

- Cholesterol reducing medication

A large-scale randomized controlled trial (n=4731) in stroke (or TIA) patients concluded that 80 mg atorvastation per day reduced the overall incidence of strokes and of cardiovascular events, despite a small increase in the incidence of hemorrhagic stroke.

8. QUALITY INDICATORS REMOVED UPON EXPERTS' ADVICE

	Reason of exclusion
Proportion of patients with TIA who are investigated and discharged from the emergency department who are referred to organized secondary stroke prevention services.	Not related to acute stroke
Rehabilitation goals agreed by the multi-disciplinary team by discharge	Already part of a process indicator in Late-stage inpatient rehabilitation & discharge plan
Participation of the hospital in stroke education campaigns of the population	Mainly found in practice in US; not applicable to Belgian setting
Implementation of a multidisciplinary Stroke Team in the hospital[11].	Not necessary if a stroke unit is already in place
Related to the conduct or volume of carotid endarterectomy	Not directly related to acute stroke care
In hospital or in stroke unit complications	Too vague - Already covered by the most specific complication, linked to swallowing problem: in 'hospital-acquired pneumonia rate for ischemic stroke'
Presence of a laboratory that is available 24/7	In all acute hospitals
Early supported discharge rates	Not applicable to every stroke unit
Discharge/transfer to other departments due to complications (intensive care, internal medicine, neurosurgery, etc.)	Would need a definition of complications

[11] A multidisciplinary stroke team is defined as daily presence of physician, nurse and physiotherapist, presence of speech therapist, occupational therapist and social service if required and 24 hours availability of physician with stroke expertise (at least 6 month training in certified stroke unit or at least 6-month training in hospital treating >250 stroke patients per year). Development of integrative multidisciplinary treatment concepts, regular multidisciplinary team meetings, multidisciplinary ward rounds, regular continuous education of all stroke team members required

9. RATING BY EXPERTS

9.1. Methodology

No formal Delphi procedure was performed on the rating of quality indicators by selected experts. The results of this section are presented to reflect the general perception of stroke care quality indicators from clinician's point of view. If needed, the selection of QI for accreditation or national use purpose will be further proceeded through a formal Delphi process.

Seven experts (6 specialist clinicians from the Belgian Stroke Council and one MD data manager) rated the indicators on a scale from 1 (strongly disagree) to 9 (strong agree). They were asked to take the following 6 dimensions into account (cf. KCE report 41):

- Relevance: the topic area and aspect of health that the indicator addresses are of significant clinical importance;
- Validity: an indicator should measure what it is intended to measure;
- Reliability: an indicator should produce a similar result when repeatedly applied to the same population;
- Specificity: each indicator should have explicit and detailed specifications for the numerator and denominator in order to be specific;
- Feasibility: a quality indicator should use currently available data or data that could be easily collected with a minimum of expense and personnel time;
- Potential for improvement: the results of the measurement have to result in actions that are under control of the user, leading to improvements that are known to be feasible.

For each QI a median, minimum and maximum score was calculated, together with the percentage of 'agree' scores for inclusion (i.e. '7', '8' and '9' scores). The scores were further grouped into three categories:

- Score 7-9: inclusion
- Score 4-6: uncertain
- Score 1-3: exclusion

A face-to-face meeting with the experts was held on 2nd May 2012 to finalize the categorization of the QI's, to remove duplicate QI's and to give advice on the most appropriate QI according to the criteria defined above.

9.2. Results

Seven experts rated the proposed QIs (one of them only completed the last section on QIs from the analysis of the countries). The results were discussed in a group meeting with the involvement of additional experts (e.g. experts from the National Institute for Health and Disability Insurance, Ministry of Public Health, and nurses in stroke units).

The following tables present the ratings for the process indicators, outcome indicators, structure indicators and additional indicators from the analysis of the countries. More information on the indicators can be found in the scientific report, chapter three).

All QIs listed in the summary tables below are ranked in each category by descending order of percentage of "inclusion" (the proportion of experts who gave a score between 7 and 9). The ranking is further refined, based on the sum of scores given by all appraisers who gave a rating for that QI. The range for the sum of the scores can theoretically vary between 63/63 (if all experts rated the QI and gave 9) to 6/54 (if 6 experts only rated the QI and gave 1). The denominator varies according to the number of experts who gave a score, for example 54 if 6 experts answered.

Within the same category, the best indicator(s) (the one ranks at the highest place) is highlighted in bold. For categories where only one indicator is available, only those above 60% are highlighted in bold.

In a given category (QI's with similar content) the QIs that obtained the highest level of "inclusion" (scored between 7 and 9) are first listed and highlighted in bold. In case of similar score, the one with the highest total score of the 7 (or 6) experts are then first listed and highlighted in bold. Some other QIs are highlighted in bold because of the recommendation of the working group meeting.

Nine additional QI's were removed from the initial list based on expert consensus (see appendix 8). The main reasons were:

- They were not applicable to the Belgian setting (primary prevention is not made by hospitals, all acute hospitals have a laboratory available 24/24);
- They were not applicable to the care in acute stroke units (presence of a stroke team in the hospital, volume of carotid surgery);
- They were better defined elsewhere rehabilitation goals);
- Their definition was not precise (complications) versus other indicators found elsewhere;
- They were not applicable to all acute stroke units (early supported discharge rates).

9.2.1. Ratings for the process indicators identified in the literature

Specific topics about process indicators have been discussed during the expert meeting (when appropriate they are also mentioned as footnotes in the Tables below):

- (Almost) all indicators should be highlighted in some categories, independently of the scores:
  - when the different QI do not measure similar problems (e.g. category 16, inpatient assessment);
  - when the indicators are complementary (for example neurological assessment).
- Neurological assessment: this quality indicator has to reflect the use of a valid scale for the assessment. The National Institutes of Health (NIH) stroke scale (see indicator 14) is widely used. However, other health professionals might use more simple scales (e.g. Glasgow scale), also depending on the time of administration (at arrival of the ambulance);
- The measurement of clinical parameters at the admission is a very basic requirement. Their documentation should be grouped in one indicator “basic parameters” (e.g. blood pressure, glycemia, initial neurological assessment, ECG);
- One intervention can be recorded under different categories, according to the data collection method and the purpose of the QI (e.g. the fact that an intervention has been performed (clinical QI), versus the documentation of this action (as for example of an ECG);
- However, documentation of all clinical quality indicators should be the rule (only a few ones have been recorded in category 15);
- Delays (e.g. brain imaging, time to hospital): time before an intervention often varies between definitions:
  - There is little evidence to justify the choice of a cut-off versus another one, except for specific QIs (as thrombolytic therapy);
  - For brain imaging , experts noted that the delay should be rather 3.5 hours (versus 2 hours);
  - Quality indicators on delays before interventions should rather be recorded as continuous data (e.g. minutes) to make analyses according to different tresholds (as these can also evolve with new scientific developments). Anyhow, before introducing a QI for a specific purpose (e.g. to measure clinical performance in one hospital, or to gather information on a national level etc.) a pilot study is necessary to test feasibility of data collection and to see which way of data collection fits best the preset purpose.
- Denominator: the patient population needs to be adapted in case of interventions that benefit to a subgroup of patients only (e.g. carotid revascularization). For many QI, further elaboration of the precise definitions of the terminology used in that QI will be necessary before practical implementation can take place.
- Patient’s assessment (mood, satisfaction) requires the use of a valid scale, if possible standardised to allow comparisons between settings.

Table 1: Process indicators rated by experts

QI	Definition	Median score	% of "inclusion " (7, 8, 9)	% of "uncertain " (4, 5, 6)	% of "exclusion" (1, 2, 3)	Summary of level of evidence	Sum score/total
1. Initial neurological assessment by medical/ paramedics[12]	**Assessment of the level of consciousness**	**9**	**100%**	**0%**	**0%**	B	53/54
	Cognitive/mental test (if the patient is alert)	9	83%	17%	0%		50/54
	Visual field testing (if the patient is alert)	9	83%	17%	0%		48/54
	Sensory testing (if the patient is alert)	8	67%	33%	0%		44/54
	Assessment of eye movement	8	67%	33%	0%		43/54
	Assessment of visual inattention (if the patient is alert)	7.5	50%	50%	0%		43/54
2. Time to hospital	**Proportion of acute ischemic stroke patients who arrive at hospital within 3.5 hours of stroke symptom onset**	**9**	**83%**	**17%**	**0%**	D	48/54
3. Brain imaging	**Percentage of patients receiving first brain imaging within ≤1 hour after admission among all patients hospitalized within ≤2 hours**[13] **after stroke onset and with adequate stroke severity to perform intravenous thrombolysis (NIHSS on admission between 4 and 25) and between 18 and 80 years of age.**	**9**	**83%**	**17%**	**0%**	A	48/54
	Clear diagnosis of site/type of lesion	8	83%	17%	0%		46/54
	Proportion of stroke patients who receive a brain CT/MRI within 24 hours of hospital arrival	6.5	50%	17%	33%		34/54
	Percentage of final reports for CT or MRI studies of the brain performed within 24 hours of arrival to the hospital for patients aged 18 years and older with either a diagnosis of ischemic stroke or TIA or intracranial hemorrhage or at least one documented symptom	6	50%	17%	33%		34/54

12 Experts' comment: it might depend upon the care professional and setting. There is a range of choice on preferred scales to be used (e.g. NIHSS, Glasgow coma scale)

13 Experts' comment: 3.5 hours would be more appropriate here

	consistent with ischemic stroke or TIA or intracranial hemorrhage that include documentation of the presence or absence of each of the following: hemorrhage and mass lesion and acute infarction						
4. Thrombolytic therapy	**Proportion of all thrombolysed ischemic stroke patients who receive acute thrombolytic therapy within one hour of hospital arrival**	**9**	**83%**	**17%**	**0%**	A	51/54
	Percent of acute ischemic stroke patients for whom IV thrombolytic therapy was initiated at the hospital within 3 hours (less than or equal to 180 minutes) of time last known well	9	83%	17%	0%		51/54
	Percent of patients with acute ischemic stroke who arrive at the hospital within 120 minutes (2 hours) of symptom onset for whom IV t-PA was initiated at this hospital within 180 minutes (3 hours) of symptom onset	8.5	83%	17%	0%		48/54
	Percentage of patients aged 18 years and older with the diagnosis of ischemic stroke whose time from symptom onset to arrival is less than 3 hours who were considered for tissue plasminogen activator (t-PA) administration	8.5	83%	17%	0%		47/54
5. Swallow/ dysphasia screen	**Percentage of patients aged 18 years and older with the diagnosis of ischemic stroke or intracranial hemorrhage who underwent a dysphasia screening process before taking any foods, fluids or medication by mouth**	**9**	**83%**	**17%**	**0%**	A	50/54
	Patients with ischemic or hemorrhagic stroke who undergo screening for dysphasia with an evidence-based bedside testing protocol before being given any food, fluids, or medication by mouth.	8.5	83%	17%	0%		47/54
	Screened for swallowing disorders within first 24 hours of admission	8	83%	0%	17%		44/54
	Proportion of patients assessed by bedside screening in order to determine the extent of aspiration and the severity of swallow dysfunction no later than the first day	7.5	83%	0%	17%		42/54

	of hospitalization						
	Swallowing test	8.5	67%	33%	0%		45/54
6. BP	Baseline determination of BP, at the ED	9	83%	17%	0%	D	50/54
7. Glycemia	Baseline determination of glycemia, at the ED	9	100%	0%	0%	B	52/54
8. Treated in SU	**Percentage of stroke patients admitted to stroke unit during acute hospital stay**	**9**	**83%**	**0%**	**17%**	A	45/54
	The proportion of all acute stroke patients who are managed on a designated geographically defined integrated, acute, and/or rehabilitation stroke unit at any point during hospitalization	7.5	67%	17%	17%		38/54
	Patients treated for 90% of stay in a Stroke Unit (as calculated)	4.5	17%	50%	33%		25/54
	Proportion of patients who are admitted to a stroke unit no later than the 2nd day of hospitalization	1.5	0%	33%	67%		16/54
9. Early antiplatelet/ anticoagulant administration	**Percentage of patients after ischemic stroke or TIA treated with antiplatelet within ≤48 hours after stroke onset if an intracranial haemorrhage and contraindications against antiplatelet are excluded. Patients <18 years, patients receiving anticoagulants and patients admitted >48 hours after stroke onset are excluded.**	**8.5**	**100%**	**0%**	**0%**	A	51/54
	Proportion of acute ischemic stroke and TIA patients who receive acute antiplatelet therapy within the first 48h hours of hospital arrival	8.5	100%	0%	0%		51/54
	Percentage of stroke patients diagnosed with an ischemic stroke with documented evidence of aspirin administration administered within 48 hours of presentation to hospital during audit period	8.5	100%	0%	0%		51/54
	Commencement of aspirin with 48h for thrombotic/thromboembotic stroke	8.5	83%	17%	0%		47/54
10. VTE	**Percent of ischemic and hemorrhagic stroke patients who have received venous**	**9**	**83%**	**17%**	**0%**	C	50/54

prophylaxis	**thromboembolism (VTE) prophylaxis or who have documentation why no VTE prophylaxis was given the day of or the day after hospital admission**						
	DVT prophylaxis (compression stockings & /or heparin/low-molecular weight heparin)	8.5	83%	17%	0%		49/54
	DVT prevention among bedridden/hemiparetic patients with proper measures	8.5	83%	17%	0%		48/54
11. Early mobilization/ rehabilitation (including assessment) by PT/OT/SP	**Percentage of stroke patients with documented physiotherapy assessment within 48 hours of admission to hospital during audit period**	**9**	**100%**	**0%**	**0%**	A	53/54
	Proportion of patients assessed by a physiotherapist no later than the 2nd day of hospitalization in order to clarify of the extent and type of rehabilitation and time for initiation of physiotherapy	9	83%	17%	0%		51/54
(PT: physiotherapist OT: occupational therapist ST: speech therapist)	Proportion of stroke patients with a rehabilitation assessment within 48 hours of hospital admission for acute ischemic stroke and within 5 days of admission for hemorrhagic stroke.	9	83%	17%	0%		50/54
	Proportion of patients assessed by an occupational therapist no later than the 2nd day of hospitalization in order to clarify of the extent and type of rehabilitation and time for initiation of occupational therapy	**9**	**83%**	**17%**	**0%**		49/54
	Assessment for rehabilitation (PT/OT)	8.5	83%	0%	17%		45/54
	Patients screened for communication/language defects	8.5	83%	0%	17%		44/54
	Occupational therapist assessment	7.5	83%	0%	17%		43/54
	Assessment by an occupational therapist within 4 working days of admission	7.5	83%	0%	17%		43/54
	Early mobilization	8	83%	0%	17%		42/54
	Percentage of patients with documented paresis on admission and substantial functional deficit (Rankin Scale ≥3 or Barthel Index ≤70 within first 24 hours after	9	67%	33%	0%		47/54

	admission) who were seen or treated by physiotherapist or occupational therapist within the first 2 days after admission. Patients with transient ischemic attack (TIA) are excluded.						
	Median time (in days) between hospital arrival and evaluation by a rehabilitation professional	8	67%	33%	0%		45/54
	Proportion of patients who have an assessment of nutritional risk no later than the 2nd day of hospitalization	9	67%	17%	17%		45/54
	Assessment by a physiotherapist	7.5	67%	17%	17%		43/54
	Percent of patient that received an evaluation by a rehabilitation professional	8.5	67%	17%	17%		42/54
	Percent of ischemic stroke patients with stroke on arrival with completion of an initial functional assessment (FIM) to assess the need for rehabilitation intervention	7	67%	17%	17%		40/54
	Physiotherapy assessment within first 72 hours of admission	7	67%	17%	17%		39/54
	Assessment of the establishment of rehabilitation treatment within the first 5 days	8	67%	0%	33%		38/54
	Percent of patients with fall risk assessment using the Morse Fall Scale completed by the end of hospital day two	6.5	50%	33%	17%		37/54
	Percentage of patients dependent in transfer from bed to chair (Barthel Index Item “Transfer” 0–10 within first 24 hours after admission) who are mobilized within the first 2 days after admission. Patients with TIA or increased intracranial pressure or disturbances of consciousness are excluded.	6.5	50%	33%	17%		36/54
12. Vascular imaging	**Proportion of patients who undergo an ultrasound/CT-angiography of the carotid arteries no later than the 4th day of hospitalization**	**8.5**	**100%**	**0%**	**0%**	B	50/54
	Percentage of patients with ischemic stroke or TIA who	8	67%	33%	0%		46/54

	receive vascular imaging of extracranial arteries (Doppler or Duplex or DS-angiography or CT-angiography or MR-angiography) during hospitalization.						
13. ECG	**ECG during hospitalization**[14]	**8**	**83%**	**0%**	**17%**	A	42/54
	Electrocardiogram	7.5	67%	17%	17%		39/54
14. Echocardiography	**Echocardiography in ischemic stroke**	**8.5**	**83%**	**17%**	**0%**	C	49/54
15. Documentation & risk assessment	**Documented pre-morbid function**	**8.5**	**83%**	**0%**	**17%**	C	43/54
	Documentation of frequent multidisciplinary meetings	**8**	**71%**	**0%**	**29%**		46/63
	Percent of patients with ischemic stroke on arrival with NIH Stroke Scale score documented in the medical record by the end of hospital day 2	**8**	**67%**	**0%**	**33%**		37/54
	Conformity scoring for the content of the patient's dossier treated for stroke	6.5	50%	33%	17%		35/54
16. Carotid revascularization	**Wait time from ischemic stroke or TIA symptom onset to carotid revascularization**	**9**	**67%**	**17%**	**17%**	D	43/54
17. Inpatient assessment (weighing, glycaemia, hypertension, fever, dyslipidemia, incontinence, pressure sores etc.)	**Establishment of an adequate antihypertensive treatment among targeted patients**	**9**	**100%**	**0%**	**0%**	A	52/54
	Investigation of lipid profile and establishment of treatment when necessary	**9**	**100%**	**0%**	**0%**		52/54
	Incontinence addressed, and a care plan formulated to avoid catheterization	**9**	**100%**	**0%**	**0%**		52/54
	Assessment of body temperature and prescription of antithermics when necessary (temperature 37.5° C)	9	100%	0%	0%		51/54
	Risk assessment or plan to avoid pressure sores	8	67%	33%	0%		45/54
18. Late-stage inpatient	**Patient/carer aware of diagnosis and prognosis**	**9**	**100%**	**0%**	**0%**	C	51/54
	Social work assessment	**8.5**	**100%**	**0%**	**0%**		51/54

[14] Experts suggested to group the following QI as “basic parameters”: Initial neurological assessment- Blood pressure- Glycemia- ECG

rehabilitation & discharge plan	**Patient/carer aware of discharge planning**	**8**	**83%**	**17%**	**0%**	A	46/54
	Percentage of stroke patients with documented care plan developed and provided to patient/family prior to hospital discharge	7	50%	33%	17%		39/54
	Documentation of living conditions	6	33%	50%	17%		33/54
	Home visit performed before discharge		33%	17%	50%		
19. Anticoagulation for AF	**Percent of ischemic stroke patients with atrial fibrillation/flutter who are prescribed anticoagulation therapy at hospital discharge**	**9**	**100%**	**0%**	**0%**	B	52/54
	Percent of patients with ischemic stroke on arrival who have atrial fibrillation/flutter and are discharged on anticoagulation therapy	8	83%	17%	0%		47/54
	Patients with an ischemic stroke or hemorrhagic stroke who were assessed for rehabilitation services	8.5	83%	0%	17%		44/54
	Proportion of patients with acute ischemic stroke and atrial fibrillation where treatment with oral anticoagulants is initiated no later than the 14th day of hospitalization	7	67%	17%	17%		38/54
	Percentage of patients with ischemic stroke or TIA and atrial fibrillation receiving anticoagulation at discharge who are discharged home or to an inpatient rehabilitation unit and who are mobile (Barthel Index Item “Transfer” 10–15 and Barthel Index Item “Mobility” 10–15) and minor disabled (Rankin Scale 0–3) at discharge. Patients <18 years are excluded	5.5	33%	33%	33%		29/54
20. Antiplatelet/ anticoagulant at discharge	**Patients with an ischemic stroke prescribed antithrombotic therapy at discharge**	**9**	**100%**	**0%**	**0%**	C	52/54
21. Smoking cessation	**Counseling for smoking cessation**	**9**	**100%**	**0%**	**0%**	C	53/54
	Proportion of patients with ischemic stroke on arrival with a history of smoking cigarettes, who are, or whose caregivers are, given smoking cessation advice or counseling during hospital stay. For purposes of this	7	67%	17%	17%		39/54

	measure, a smoker is defined as someone who has smoked cigarettes anytime during the year prior to hospital arrival.						
22. Patient education	**Patients with ischemic or hemorrhagic stroke or their caregivers/families who were given education and/or educational materials during the hospital stay addressing all of the following: personal risk factors for stroke, warning signs for stroke, activation of emergency medical system, need for follow-up after discharge, and medications prescribed at discharge.**	**9**	**83%**	**17%**	**0%**	B	49/54
23. Antihypertensive agent	**Percentage of stroke patients with documented evidence that antihypertensive agent was prescribed and administered prior to discharge from the hospital during audit period.**	**9**	**83%**	**17%**	**0%**	B	49/54
24. Cholesterol reducing medication	**Statin therapy on discharge**	**9**	**100%**	**0%**	**0%**	B	51/54
	Percent of patients with ischemic stroke on arrival with LDL>100 mg/dL, or LDL not measured, or on cholesterol-reducer prior to admission, who are discharged on cholesterol reducing drugs.	9	83%	17%	0%		49/54
	Discharge on lipid lowering therapy	8.5	83%	17%	0%		48/54
25. Mood assessment	**Mood assessed by discharge**	**8**	**100%**	**0%**	**0%**	C	48/54

9.2.2. Ratings for the outcome indicators identified in the literature

The objectives and validity of outcomes indicators were discussed with the experts: outcome indicators cannot be considered as markers of quality of care only, as other parameters play a role in the results (e.g. severity). However, this data collection is of utmost importance not only for the institutions (temporal evolution) but also to guide the decisions of the authorities (incidence, readmission, long term care after hospitalization),

Table 2: Outcome indicators rated by experts

QI	Definition	Median score	% of "inclusion" (7, 8, 9)	% of "uncertain" (4, 5, 6)	% of "exclusion" (1, 2, 3)	Sum score/total
26. New stroke events	**Age-standardized rate of new stroke events admitted to an acute care hospital, per 100,000 population age 20 and older**	**7**	**60%**	**40%**	**0%**	**33/45**
27. Readmission rate	**Proportion of acute stroke and TIA patients that are discharged alive that are then readmitted to hospital with a new stroke or TIA diagnosis within 90 days of index acute care discharge**	**8.5**	**83%**	**17%**	**0%**	**47/54**
28. Mortality	**Stroke death rates for 7-day in-hospital stroke fatality; 30 day all cause mortality; one year all cause mortality, for patients with ischemic stroke, intracerebral hemorrhagic stroke, subarachnoid hemorrhage, and transient ischemic attack**	**7.5**	**67%**	**33%**	**0%**	**45/54**
29. Improvement on speech and language	Proportion of stroke patients in each risk-adjusted group that make at least one level of progress on the Augmentative-Alternative Communication Functional Communication Measure (FCM)	6.5	50%	50%	0%	42/54
	Proportion of stroke patients in each risk-adjusted group that make at least one level of progress on one of the subscales of the Functional Communication Measure (FCM)	6.5	50%	50%	0%	42/54
30. Quality of life	Probability of patients treated in a specific hospital for good quality of life (measured with validated instrumental scales, e.g. SF-36 at three months) three months after stroke in comparison to all hospitals. Patients treated in hospitals with follow-up rate <75% are excluded.	6	33%	50%	17%	34/54
31. Hospital-acquired pneumonia rate for ischemic stroke	**Probability of ischemic stroke patients to acquire new pneumonia during stay in a specific hospital in comparison to all hospitals adjusted for age, sex, stroke severity and artificial respiration.**	**8.5**	**100%**	**0%**	**0%**	**50/54**

9.2.3. Ratings for the structure indicators identified in the literature

The utility of structure indicators has been discussed, in particular:

- The relevance of these indicators in the absence of adequate, on time use (e.g. availability of brain imaging);
- The need for further precision of content (e.g. training);
- As stated above (structure indicators) staff levels and training need further definition adapted to the Belgian context.

Table 3: Structure indicators rated by experts

QI	Definition	Median score	% of "inclusion" (7, 8, 9)	% of "uncertain" (4, 5, 6)	% of "exclusion" (1, 2, 3)	Summary of level of evidence	Sum score/total
32. Stroke/TIA register	**The general practice can produce a register of patients with stroke or TIA**	**9**	**83%**	**17%**	**0%**	D	51/54
33. Participation of the hospital in training of emergency medical services in stroke	**Participation of hospital staff in training of emergency medical services in stroke. Training could be performed in cooperation with other hospitals. Training should be performed at least once a year.**	**9**	**100%**	**0%**	**0%**	A	53/54
34. 24 h availability of brain imaging including radiological expertise in 'stroke imaging' in the hospital	**24 hours availability of brain imaging including radiological expertise[15] in 'stroke imaging' in the hospital.**	**9**	**100%**	**0%**	**0%**	D	54/54
35. Implementation of an internal and external quality management system in the hospital	**Existence of an internal system for quality management in the hospital, including continuous evaluation of operational procedures and workflow in the hospital, and participation of the hospital in a standardized project for external comparison of quality of care (benchmarking), including documentation of standardized stroke assessment scales.**	**8**	**83%**	**17%**	**0%**	D	45/54

15 Radiological expertise in 'stroke imaging' is defined as a physician with experience in interpretation of CT/MRI (at least 6 months training in neuroradiological department or 6 months training in certified stroke unit). If no radiological expertise is present at the hospital, telemedical consultation for the interpretation of the images is possible.

36. Availability of vascular imaging and of diagnostic cardiologic methods at the hospital	**Availability of vascular imaging (defined as diagnostic facilities to examine cerebral arteries including extracranial carotid arteries using ultrasound [Doppler or Duplex] or angiographic methods [CT-, MR- or DS-angiography] and of diagnostic cardiologic methods at the hospital [defined as evaluation by cardiologist including availability of long-term ECG, transthoracic and transesophageal echocardiography]). Diagnostic methods may not necessarily be performed in the same hospital where stroke care takes place**	**9**	**100%**	**0%**	**0%**	D	51/54
37. Availability of biological monitoring in the hospital	**Availability of biological monitoring in the hospital to monitor basic vital parameters including blood pressure, heart rate, body temperature and oxygen saturation.**	**9**	**100%**	**0%**	**0%**	D	53/54
38. Stroke admission (ER)	**The emergency department admission volumes for patients with ischemic stroke, intracerebral hemorrhagic stroke, subarachnoid hemorrhage, and transient ischemic attack.**	**9**	**100%**	**0%**	**0%**	D	54/54
39. Stroke admission (inpatient)	**The hospital inpatient admission volumes for patients with ischemic stroke, intracerebral hemorrhagic stroke, subarachnoid hemorrhage, and transient ischemic attack.**	**9**	**100%**	**0%**	**0%**	D	54/54
40. Length of stay (acute)	**Total acute inpatient hospital length of stay**	**8**	**83%**	**0%**	**17%**	D	42/54
41. Length of stay (stroke unit)	**Median total time spent on a stroke unit for each patient during inpatient stay**	**8**	**67%**	**0%**	**33%**	D	37/54
42. Discharge destination (acute)	**Distribution of discharge locations (dispositions) for acute stroke patients from acute inpatient care to: home (with and without services); inpatient rehabilitation (General or specialized); long term care; and to palliative care (each stratified by stroke type and severity).**	**8**	**83%**	**17%**	**0%**	D	46/54

9.2.4. *Ratings for the additional indicators identified in the analysis of the countries*

Experts provided comments on specific indicators:

- A team providing a 24/7 interventional services in every stroke unit is desirable but not always feasible;
- The measurement of indicators at the long term (e.g. disability) raises the question of the burden and standardisation of the data collection; at the level of an individual hospital it is also linked to case-mix.

Table 4: Additional indicators (from the analysis of the countries) rated by experts

QI	Definition	Median score	% of "inclusion" (7, 8, 9)	% of "uncertain" (4, 5, 6)	% of "exclusion" (1, 2, 3)	Sum score/total
Quality indicators accreditation: process	**Related to the measurement of the evolution of the functional status (eg Activity of Daily Living, mRS)**	**8**	**71%**	**0%**	**29%**	**46/63**
Quality indicators accreditation: outcome	**In hospital or in stroke unit complications**	**9**	**86%**	**0%**	**14%**	**56/63**
	Longer term outcome (outcome at least 30 days after stroke assessed by a functional outcome score like mRS, Barthel index, Glasgow outcome scale or FIM)	**9**	**71%**	**0%**	**29%**	**47/63**
Quality indicators accreditation: structural	Presence of an intensive care unit within the hospital	9	57%	14%	29%	43/63
	Presence of neurosurgery department or presence of a protocol to transfer to a facility allowing neurosurgery	8	57%	14%	29%	44/63
	Presence of vascular surgery department or presence of a protocol to transfer to a facility with vascular surgery	8	57%	14%	29%	43/63
	Presence of a team providing interventional radiology services (stenting, thrombectomy, coiling) (24/7)[p]	6	14%	57%	29%	32/63
Quality indicators	Disability at 1, 3 or 6 months	6	43%	14%	43%	37/63

[p] Experts' comment: hyper-equipped stroke units only, not feasible to all stroke units at this stage

national -not strictly linked to accreditation	Institutionalisation rates	5	43%	29%	29%	36/63
	Patient satisfaction with services[q]	6	43%	43%	14%	38/63
Staff level features	Staffing levels of physicians	5	29%	29%	43%	33/63
	Staffing level of specialized physicians (vascular neurologist, stroke medicine specialist)	**8**	**71%**	**14%**	**14%**	**50/63**
	Staffing levels of nurses (eg nurses per bed, nurses per admissions per year)	7	57%	14%	29%	38/63
	Staffing levels of specialized stroke nurses	**8**	**86%**	**0%**	**14%**	**51/63**
	Staffing levels of physiotherapists	7	57%	14%	29%	40/63
	Staffing levels of occupational therapists	7	57%	14%	29%	40/63
	Staffing levels of other paramedic disciplines (eg psychologist)	7	57%	29%	14%	43/63
	Presence of a multidisciplinary team	**9**	**71%**	**0%**	**29%**	**46/63**
Staff education training features	**Training & education of physicians (eg training in neurology or stroke, NIHSS certification, attendance of conferences)**	**8**	**71%**	**0%**	**29%**	**47/63**
	Training & education of nurses (eg training in stroke, annual course attendance, …)	**8**	**71%**	**0%**	**29%**	**47/63**
	Training & education of physiotherapists (eg training in stroke, annual course attendance,…)	**8**	**71%**	**0%**	**29%**	**45/63**
	Training & education of occupational therapists (eg training in stroke, annual course attendance,…)	**8**	**71%**	**0%**	**29%**	**45/63**
	Training & education of other paramedic disciplines (eg training in stroke, annual course attendance,…)	**8**	**71%**	**0%**	**29%**	**46/63**
Structural features/criteria for accreditation	Presence of a minimum number of beds (in a dedicated stroke unit)	7	57%	14%	29%	41/63
	Presence of cardiac monitors within the stroke unit	**8**	**71%**	**0%**	**29%**	**45/63**

[q] Experts' comment: only valuable when standardized instrument is used to assess patient satisfaction

	Presence of automated blood pressure monitoring within the stroke unit	3	29%	14%	57%	31/63
Others	**Early detection of atrial fibrillation (timing to first ECG-cardiac monitoring upon admission)**	**8**	**71%**	**0%**	**29%**	**45/63**
	Adapted feeding methods if persistent dysphagia	**8**	**71%**	**0%**	**29%**	**46/63**
	Feedback/instructions to referring MD/GP at discharge	**8**	**71%**	**0%**	**29%**	**46/63**

10. QUESTIONNAIRE FOR THE ANALYSIS OF THE ORGANIZATION OF STROKE UNITS IN OTHER COUNTRIES

Definitions

In this questionnaire we will examine stroke wards (a discrete ward caring exclusively for stroke patients with a multidisciplinary team including specialist nursing staff), especially acute stroke units accepting patients within the first seven days of stroke. These generally fall into the following subcategories: intensive stroke units (a model of care with continuous monitoring, high nurse staffing levels and the potential for life support), semi-intensive stroke units (a model of care with continuous monitoring, high nurse staffing but no life support facilities; and'non-intensive'units (a model of stroke care without continuous monitoring or life support). These stroke units may or may not provide rehabilitation for at least several weeks if necessary (comprehensive stroke units).

Certification refers to confirmation of certain characteristics of an organization. This confirmation is provided by some form of external review, assessment, or audit. This confirmation is formally provided in a certification text. Self-certification is NOT covered by this questionnaire.

Quality measures or criteria refer to mechanisms that enable the user to quantify the quality of a selected aspect of care.

In this questionnaire we will in part I assess certification procedures and in the part II we will assess quality measures or criteria. Most certification procedures will entail the assessment of quality measures or criteria, but on the other hand health payers/insurers may follow quality criteria or measures related to stroke care in general without formalizing certification of a center as a stroke unit. For instance, any hospital may have to measure a parameter like stroke mortality regardless of the presence of a certification procedure.

In some countries, health care is organized on a nationwide basis, in others it is organized on a regional basis (eg Länder in Germany) and some countries have a mixed system where some aspects of health care are regional and other aspects are organized on a national level. Where relevant we will indicate in our questionnaire at which level the question is answered.

Thank you for your cooperation in filling out this questionnaire.

1. Identification

1.1. Name _____

_____

1.2. Country _____

_____

1.3. Region _____

_____

1.4. Date of interview (dd/mm/yy)

_____

1.5. Position _____

_____

1.6. Briefly describe your expertise in the topic of stroke unit/center certification and quality improvement programs:

_____

_____

_____

_____

1.7 My answers will in general reflect answers (select one suitable option) :

- ❑ At country level
- ❑ At regional level
- ❑ Both?

Please explain below if mixed

_____

_____

_____

_____

2. Certification procedure

2.1 Is there a formal process to certify stroke units in your country or region?

- ❑ Yes
- ❑ No

2.2 Is this at the national level, at the regional level?(multiple selections are possible)

- ❑ National level
- ❑ Regional level
- ❑ Both national and regional level

If Regional, which region?

_____

_____

_____

_____

Mixed level, please explain

_____

_____

_____

_____

2.3 In what year did certification of stroke units start in your country or region?

- ❑ < 1994
- ❑ 1995
- ❑ 1996
- ❑ 1997
- ❑ 1998
- ❑ 1999
- ❑ 2000
- ❑ 2001

- ❑ 2002
- ❑ 2003
- ❑ 2004
- ❑ 2005
- ❑ 2006
- ❑ 2007
- ❑ 2008
- ❑ 2009
- ❑ 2010
- ❑ 2011

2.4. Which type of stroke units are certified within your region or country? (please select suitable option(s) : multiple selections are possible)

- ❑ Intensive stroke units (a model of care with continuous monitoring, high nurse staffing levels and the potential for life support)
- ❑ Semi-intensive stroke units (a model of care with continuous monitoring, high nurse staffing but no life support facilities)
- ❑ Non-intensive stroke units (a model of stroke care without continuous monitoring or life support)
- ❑ Comprehensive stroke units (providing rehabilitation in the same units for several weeks)
- ❑ Long term facilities not accepting acute stroke patients
- ❑ Rehabilitation hospitals where stroke patients are mixed with other types of neurologic or other patients
- ❑ Mobile stroke teams
- ❑ Other type of stroke units

Please describe briefly

_____

_____

_____

_____

2.5 Are there different levels of stroke units in your country?

	Yes	No
Is there a subdivision in primary stroke units and comprehensive units (centers capable of delivering the full spectrum of care to seriously ill patients with stroke and cerebrovascular disease) recognized by the certifying authority?	❑	❑
Is there a subdivision in regional or supraregional stroke units recognized by the certifying authority?	❑	❑
Is there a subdivision into hyperacute stroke units (HASU=units that provide the immediate response to a stroke, where the patient is stabilised and receives primary intervention. The patient's length of stay is up to 72 hours) and other stroke units (units that provide multi-therapy rehabilitation and ongoing medical supervision following a patient's HASU stabilization. Length of stay varies and will last until the patient is well enough for discharge from an acute inpatient setting)?	❑	❑

2.6 Is the system for certification only assessing stroke unit care per se or does it certify other aspects of the chain of stroke care preceding or occurring after stroke unit care?

- ❑ Only stroke unit care
- ❑ Other aspects then only stroke unit included

2.7 Please specify the other aspects next to the stroke unit itself

- ❑ Prehospital care
- ❑ Emergency services
- ❑ Post-stroke unit rehabilitation (chronic rehabilitation)
- ❑ Intensive care services
- ❑ Outpatient stroke clinic or follow up clinic
- ❑ Early supported discharge teams
- ❑ Liaison with primary care
- ❑ Other

Please describe briefly

_____

_____

_____

_____

2.8 Is the system for certification only assessing the stroke unit per se or does it certify other processes related to stroke management

- ❑ Yes, only stroke unit processes are certified
- ❑ No, stroke unit processes are certified with additional aspects

2.9 If it does certify other processes related to stroke management, please select suitable options (multiple selections are possible)

- ❑ Contact with primary care at admission
- ❑ Contact with primary care at discharge
- ❑ Contact with prehospital services
- ❑ Carotid artery procedures (endarterectomy or stenting)
- ❑ Quality of cardiac investigations
- ❑ Quality of brain imaging investigations
- ❑ Quality of interventional radiology (endovascular procedures)
- ❑ Quality of neurosurgical services
- ❑ Quality of carotid surgery
- ❑ Quality of information technology present in hospital
- ❑ Quality of general hospital safety measures (fall prevention, hospital infection prevention)
- ❑ Other aspects

Please describe briefly

_____

_____

_____

_____

2.10 Who performs the stroke unit certification? (please select suitable option(s) : multiple selections are possible)

- ❑ A government agency?
- ❑ A health insurance?
- ❑ A private company?
- ❑ Other?

Please describe which agency, company, …

_____
_____
_____
_____

2.11 Are there documents available that describe the certification procedure available to the hospital applying for certification? Please attach these documents if they are available

- ❑ No documentation is available
- ❑ They are available but I do not have access to them
- ❑ I sent the documents to vincent.thijs@uzleuven.be <mailto:Vincent.thijs@uzleuven.be>
- ❑ These documents can be found on the following web link.

Please specifiy the web link:

_____
_____
_____
_____

2.12 How is the certification done? (multiple selections are possible)

- ❑ By site inspection of the facility by a certification team?
- ❑ By direct (structured) interviews of key personnel involved in the stroke care process?
- ❑ By review of randomly selected case files - patient tracers?
- ❑ By review of collected data or averages sent to a certification agency?

- ❑ By questionnaires sent out by electronic means or by mail to key personnel in the stroke unit or the hospital management?
- ❑ By post factum review of patient records ?
- ❑ By interviewing patients & relatives ?
- ❑ Other

Please describe:

_____

_____

_____

_____

2.13 Who does the certification, who are the auditors? (please select suitable option(s) : multiple selections are possible)

	Yes	No
Is the certification done by personnel specifically trained in stroke?	❑	❑
Is the certification done by personnel that also certifies other types of systems of care?	❑	❑
Is there a specialist in stroke medicine or stroke neurologist participating in the certification procedure?	❑	❑
Is there a specialist in stroke nursing or a paramµedic participating in the certification procedure?	❑	❑
Others	❑	❑

Please describe briefly

_____

_____

_____

_____

3. Dissemination and implementation of certification findings

3.1 Is the report of the stroke certification procedure available for outside review even if no certification is achieved? (Please select suitable option(s) : multiple selections are possible)

- ❑ In a publically accessible report (eg on a website)
- ❑ To other medical (GPs) or paramedical professionals , but not to the general public
- ❑ To health insurance companies
- ❑ To government officials
- ❑ To specialists in the own institution only
- ❑ To staff members of the department hosting the stroke unit only
- ❑ To members of the board of the institution/hospital only

3.2 What are the consequences for a hospital that does not achieve stroke certification once? (please select suitable option(s) : multiple selections are possible)

- ❑ They are not allowed to care for stroke patients
- ❑ They are mandated to propose an improvement plan
- ❑ They are mandated to achieve stroke certification within a defined period of time
- ❑ They have a financial loss because of decreased reimbursement at the hospital or at the patient level
- ❑ There are no consequences in terms of admission or financial, but the hospital loses (part of) its reputation because of disclosure of the findings to medical professionals or the general public
- ❑ There are no consequences at all
- ❑ Other consequences

Please describe briefly

_____

_____

_____

_____

3.3 What are the consequences for a hospital that does not achieve stroke certification repeatedly? (please select suitable option(s) : multiple selections are possible)

- ❑ They are not allowed to care for stroke patients
- ❑ They are mandated to propose an improvement plan
- ❑ They have a financial loss because of decreased reimbursement at the hospital or at the patient level
- ❑ There are no consequences in terms of admission or financial, but the hospital loses (part of) its reputation because of disclosure of the findings to medical professionals or the general public
- ❑ There are no consequences at all
- ❑ Other consequences

Please describe briefly

_____

_____

_____

_____

3.4 Is a quality improvement plan proposed after the certification with recommendations on how to achieve certification?

- ❑ Yes
- ❑ No

Please explain briefly

_____

_____

_____

_____

3.5 Is there a redress procedure for stroke units that do not achieve certification?

- ❑ Yes
- ❑ No

Please explain if there is a redress procedure

_____

_____

_____

_____

3.6 Is the certification process mandatory for each hospital (not performed on a voluntary basis)

- ❑ Yes
- ❑ No

3.7 Can any hospital apply for stroke unit certification?

- ❑ Yes
- ❑ No

If no:

_____

_____

_____

3.8 Is this specifically restricted to specific types of hospitals? (please select suitable option(s) : multiple selections are possible):

- ❑ Only hospitals accepting acute patients
- ❑ Only hospitals with a certain number of beds/volume of patients
- ❑ Only hospitals with a certain number of acute stroke patients
- ❑ Only hospitals with a certain number of acute stroke patients undergoing thrombolysis
- ❑ Only hospitals with an emergency room
- ❑ Only hospitals with an ambulance system
- ❑ Only hospitals with an intensive care unit
- ❑ Only hospitals with a neurosurgery department
- ❑ Only hospitals with a vascular surgery department
- ❑ Only hospitals with interventional radiology services
- ❑ Only hospitals with the presence of certain technical abilities like a 24/7 lab, presence of, neuroimaging 24/7

❑ Other criteria

Please list:

_____

_____

_____

_____

4. Which criteria does the formal certification procedure take into account to certify a stroke unit?

We will assess structural features (4.1), personnel features in terms of staffing levels (4.2), amount of education and teaching of staff (4.3), presence of treatment protocols (4.4), volumes (4.5) and quality criteria (4.6).

4.1 Structural features related to stroke units?

❑ Presence of a minimum number of beds (if so, detail the minimum number of beds below)

❑ Presence of ventilatory support within the stroke unit

❑ Presence of cardiac monitors within the stroke unit

❑ Presence of automated blood pressure monitoring within the stroke unit

❑ Presence of oxygen saturation measurements within the stroke unit

❑ Other structural features

If so, detail the minimum number of beds or the required number of beds/ total number of stroke patients

_____

_____

_____

Please describe

_____

_____

_____

4.2 Personnel features (if applicable, fill in)

- ❑ Staffing levels of physicians
- ❑ Staffing level of specialized physicians (vascular neurologist, stroke medicine specialist)
- ❑ Staffing levels of nurses (eg nurses per bed, nurses per admissions per year)
- ❑ Staffing levels of specialized stroke nurses
- ❑ Staffing levels of physiotherapists
- ❑ Staffing levels of occupational therapists
- ❑ Staffing levels of other paramedic disciplines (eg psychologist, and the criteria)
- ❑ Presence of a multidisciplinary team

Please describe the criteria for the staffing level of physicians

_____

_____

_____

_____

Please describe the criteria for the staffing level of specialized physicians (vascular neurologist, stroke medicine specialist)

_____

_____

_____

_____

Please describe the criteria for the staffing level of nurses (eg nurses per bed, nurses per admissions per year)

_____

_____

_____

_____

Please describe the criteria for the staffing levels of specialized stroke nurses

Please describe the criteria for the staffing levels of physiotherapists

Please describe the criteria for the staffing levels of occupational therapists

Please describe the criteria for the staffing levels of other paramedic disciplines (eg psychologist, and the criteria)

Please describe the criteria for the presence of a multidisciplinary team

4.3 Documentation of education and training (if applicable, fill in)

- ❑ Training & education of physicians (eg training in neurology or stroke, NIHSS certification, attendance of conferences)
- ❑ Training & education of nurses (eg training in stroke, annual course attendance, …)
- ❑ Training & education of physiotherapists (eg training in stroke, annual course attendance,…)
- ❑ Training & education of occupational therapists (eg training in stroke, annual course attendance,…)
- ❑ Training & education of other paramedic disciplines (eg training in stroke, annual course attendance,…)
- ❑ Documentation of frequent multidisciplinary meetings

Please detail if training & education of physicians

_____
_____
_____
_____

Please detail if training & education of nurses

_____
_____
_____
_____

Please detail if training & education of physiotherapists

_____
_____
_____
_____

Please detail if training & education of occupational therapists

_____
_____
_____
_____

Please detail if training & education of other paramedic disciplines

_____

_____

_____

_____

Please detail if documentation of frequent multidisciplinary meetings

_____

_____

_____

_____

4.4 Documentation of the presence of treatment protocols (multiple selections are possible)

- ❑ Protocols related to acute treatment
- ❑ Protocols related to secondary prevention
- ❑ Protocols related to common stroke complications
- ❑ Protocols related to complication prevention (dysphagia, pressure ulcer)
- ❑ Protocols related to rehabilitation

4.5 Volumes

	Yes	No
Is a minimum number of stroke admissions required per year?	❑	❑
Is a minimum number of thrombolysis cases required per year?	❑	❑

If yes, please provide number

_____

_____

_____

_____

If yes, please provide number

_____

_____

_____

4.6 Which quality criteria are taken into account for certifying the stroke unit? Process indicators (multiple selections are possible)

- ❑ Related to process timings : e.g. door to hospital time, door to CT time, length of stay in emergency department ,proportion of time in stroke unit
- ❑ Related to acute medical treatment (aspirin , thrombolysis, interventional procedures)
- ❑ Related to the measurement of impairment at baseline (eg NIHSS or other impairment scale)
- ❑ Related to the measurement of impairment during in hospital follow up (eg 24 hour NIHSS or other impairment scale)
- ❑ Related to the measurement of physiological parameters at baseline (BP, glycemia, temperature)
- ❑ Related to the measurement of the evolution of the functional status (eg ADL, mRS)
- ❑ Related to the measurement of evolution of nutritional status
- ❑ Related to discharge medication (antithrombotics, statins or hypertensive medication)
- ❑ Related to complication prevention (prevention of DVT, pressure ulcer)
- ❑ Related to fall prevention
- ❑ Related to diagnostic procedures (eg percentage of CT or MRI, echocardiography, TCD….)
- ❑ Related to risk factor status (smoking, hypercholesterolemia,…)
- ❑ Related to advice about a healthy lifestyle
- ❑ Related to smoking cessation
- ❑ Related to assessment for rehabilitation (eg assessment by physiotherapy within a certain time frame)
- ❑ Related to a palliative care plan
- ❑ Related to pain
- ❑ Related to education of patients
- ❑ Related to education of families

- ❑ Related to the presence of a formal discharge plan
- ❑ Related to psychiatric disorder evaluation (mood)
- ❑ Related to screening for dysphagia
- ❑ Related to early mobilization
- ❑ Related to the conduct or volume of carotid endarterectomy
- ❑ Related to substance abuse (eg heavy alcohol consumption)
- ❑ Related to completeness of stroke etiology documentation

4.7 Outcome indicators

- ❑ In hospital or in stroke unit mortality
- ❑ In hospital or in stroke unit complications

4.8 Outcome indicators in hospital or in stroke unit complications

- ❑ Pneumonia
- ❑ Deep venous thrombosis or pulmonary embolism
- ❑ Recurrent stroke
- ❑ Symptomatic intracerebral hemorrhage rate
- ❑ Epilepsy or seizures
- ❑ Herniation
- ❑ Stroke after carotid endarterectomy
- ❑ Discharge disposition
- ❑ Days spent at home within a defined time after stroke onset
- ❑ Readmission rate within a certain time period
- ❑ Longer term outcome (outcome at least 30 days after stroke assessed by a functional outcome score like mRS, Barthel index, Glasgow outcome scale or FIM)
- ❑ Other

Which one?

_____

_____

_____

_____

4.9 Structural indicators

- ❑ Percentage of stroke patients in hospital that are admitted to a stroke unit
- ❑ Presence of a laboratory that is available 24/7
- ❑ Presence of an intensive care unit within the hospital
- ❑ Presence of neurosurgery department or presence of a protocol to transfer to a facility allowing neurosurgery
- ❑ Presence of vascular surgery department or presence of a protocol to transfer to a facility with vascular surgery
- ❑ Presence of diagnostic imaging of the carotid and/or intracranial arteries (duplex, TCD, CTA, MRA)
- ❑ Presence of advanced imaging (MRI or IADSA or advanced CT) or presence of a protocol to transfer to a facility with advanced imaging (24/7)
- ❑ Presence of a team providing interventional radiology services (stenting, thrombectomy, coiling) (24/7)
- ❑ Presence of telemedicine
- ❑ Presence of a stroke registry
- ❑ Presence of an internal quality management system in the hospital
- ❑ Presence of an external quality management system (benchmarking system)

5. Legal

5.1 Is there a law regulating the organization of stroke units or stroke centers in your country or region?

- ❑ No
- ❑ Yes

If yes, please provide the reference to the legislation

_____

_____

_____

_____

6. Guidelines

6.1 Are there guidelines from professional societies in your country that provide guidance on how to create and organize stroke units?

- ❑ No
- ❑ Yes

If yes, please provide the reference to guideline

_____

_____

_____

_____

7. Financial

7.1 Are there financial incentives to admit patients on a stroke unit compared to general or other units?

- ❑ No
- ❑ Yes

7.2 How are these financial incentives organized?

- ❑ Increased reimbursement of individual patients
- ❑ More funding to hospitals or departments that organize stroke unit care.
- ❑ Other

How much extra reimbursement provides …. EURO/GBP/other currency per patient

_____

_____

_____

_____

On an annual basis admission on a stroke unit provides an extra payment of …. EURO/GBP/other currency

_____

_____

_____

_____

Please explain

_____

_____

_____

_____

7.3 Are there financial disincentives to hospitals that do not provide stroke unit care e.g. Hospitals that do not provide stroke unit care lose ….money/patient or ….money/year?

- ❑ No
- ❑ Yes

Please explain

_____

_____

_____

_____

7.4 Are there financial incentives to certification of stroke units?

- ❑ No
- ❑ Yes

Please explain

_____

_____

_____

_____

7.5 Are there financial incentives to register patients in a stroke quality database or register?

- ❑ No
- ❑ Yes

Please explain

_____

_____

_____

_____

7.6 Are there purchaser/payer initiatives that directly financially reward physicians and other healthcare practitioners working on stroke units for achieving quality goals?

- ❑ No
- ❑ Yes

7.7 Are these initiatives related to improving quality of care (ie an improvement in measures compared to the previous year(s)?

- ❑ Yes
- ❑ No

7.8 Are these initiatives related to reaching quality targets (without a necessary improvement in measures compared to the previous year (s)?

- ❑ Yes
- ❑ No

Please provide an example

_____

_____

_____

_____

7.9 Are there purchaser/payer initiatives that financially reward the institution hosting the stroke unit for achieving quality goals?

- ❑ No
- ❑ Yes

7.10 Are these initiatives related to improving quality of care? (ie an improvement in measures compared to the previous year(s)?

- ❑ No
- ❑ Yes

7.11 Are these initiatives related to reaching quality targets (without a necessary improvement in measures compared to the previous year (s)?

- ❑ Yes
- ❑ No

8 What is the cost of stroke unit certification?

8.1 Cost for first time certification: (amount)

_____
_____
_____
_____

8.2 Cost for recertification (amount)

_____
_____
_____
_____

8.3 Who pays for stroke unit certification?

- ❑ Hospital or trust
- ❑ Stroke unit that applies for certification
- ❑ Department in which stroke care is embedded
- ❑ Regional authority
- ❑ National authority
- ❑ Insurance company
- ❑ Other

Please describe

_____
_____
_____
_____

8.4 How often is the certification procedure repeated?

- ❑ Annual basis
- ❑ Per 2 years
- ❑ Per 3 years
- ❑ Per 4 years
- ❑ Per 5 years
- ❑ Other

Please explain

_____

_____

_____

_____

9. Access, planning and organisation of stroke units?

9.1 Do ambulances have the authority to bypass hospitals that do not have a formal stroke certification?

- ❑ Yes
- ❑ No

9.2 Do stroke units in your country/region generally admit? (multiple selections)?

- ❑ Any TIA patient
- ❑ Only high-risk TIA patients
- ❑ Patients with intracerebral hemorrhage
- ❑ Patients with subarachnoid hemorrhage
- ❑ Patients with cerebral venous thrombosis
- ❑ Patients with suspected (but as yet unconfirmed) strokes
- ❑ Patients with stroke mimics

9.3 How many stroke units are currently certified in your country? And provide date of most recently updated

_____

_____

_____

_____

_____

9.4 Did health authorities use a formal method to calculate the required number of stroke units in your country or region (Geographical or population basesd criteria)?

❑ No

❑ Yes

If yes, on what basis was the number of stroke units decided? Please explain

_____

_____

_____

_____

10. This is part II of the questionnaire. This part does not assess individual stroke unit performance but assesses national or regionally developed quality indicators or performance measures for stroke in individual hospitals.

10.1 In your country or region are quality measures or criteria related to stroke recorded by an official organization (health insurance or other health authority) ?

- ❑ Yes
- ❑ No

10.2 Please indicate for your country or region which health authority collects quality measures or criteria? Please describe

_____

_____

_____

10.3 Are the measurements performed on all patients continuously?

- ❑ Yes
- ❑ No

10.4 Are the measurements performed on an intermittent basis (eg one predefined month per year)?

- ❑ No
- ❑ Yes

10.5 How frequent are the intermittent registrations?

- ❑ More than every three years
- ❑ Every three years
- ❑ Every two years
- ❑ Once per year
- ❑ Twice per year
- ❑ Three times per year

- ❑ Four times per year
- ❑ More than four times per year

10.6 Which health authority assesses the results of the quality criteria registration?

.

- ❑ Hospital trust
- ❑ Government agency
- ❑ Insurance company
- ❑ Others

Please describe

_____

_____

_____

_____

10.7 National quality indicators. Indicate which among the following are used, in your country, as measures for defining performance of health care providers in stroke care:

If you have no national indicators, please continue to 10.8

	Yes	No	Unknown
Stroke unit care	❑	❑	❑
Stroke patients admitted to a stroke unit/total admissions for stroke	❑	❑	❑
Door to hospital time	❑	❑	❑
Number of patients hospitalised within accepted time for thrombolysis	❑	❑	❑
Proportion of time in ER (before transfer to stroke unit)	❑	❑	❑
Proportion of time in stroke unit	❑	❑	❑
Performance of brain imaging	❑	❑	❑
Performance of imaging of the carotid artery	❑	❑	❑
Performance of screening for swallowing dysfunction	❑	❑	❑

Assessment by physiotherapist	❑	❑	❑
Assessment by occupational therapist	❑	❑	❑
Assessment and follow up of nutritional status	❑	❑	❑
Assessment and management of substance abuse e.g. alcohol	❑	❑	❑
Performance of thrombolytic therapy	❑	❑	❑
Performance of endovascular therapy	❑	❑	❑
Time to thrombolytic therapy	❑	❑	❑
Time to endovascular therapy	❑	❑	❑
Use of antiplatelet therapy in the acute phase of stroke	❑	❑	❑
Use of antiplatelet therapy at discharge	❑	❑	❑
Use of anticoagulants in patients with atrial fibrillation at discharge	❑	❑	❑
Use of lipid lowering medication at discharge	❑	❑	❑
Use of blood pressure lowering at discharge	❑	❑	❑
Length of stay	❑	❑	❑
Death during hospital period	❑	❑	❑
Discharge destination	❑	❑	❑
Death or disability at 1, 3 or 6 months	❑	❑	❑
Long term death or disability	❑	❑	❑
Institutionalisation rates	❑	❑	❑
Complication rates	❑	❑	❑
Quality of life measures	❑	❑	❑
Readmission rates	❑	❑	❑
Prevention therapy adherence rates	❑	❑	❑
Patient satisfaction with services	❑	❑	❑
Provision of information to patients and relatives	❑	❑	❑

Early supported discharge rates	❑	❑	❑
Completeness of etiology information	❑	❑	❑
Other	❑	❑	❑

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10.8 Regional Quality indicators

Indicate which among the following are used, in your region, as measures for defining performance of health care providers in stroke care.

	Yes	No	Unknown
Stroke unit care	❑	❑	❑
Stroke patients admitted to a stroke unit/total admissions for stroke	❑	❑	❑
Door to hospital time	❑	❑	❑
Number of patients hospitalised within accepted time for thrombolysis	❑	❑	❑
Proportion of time in ER (before transfer to stroke unit)	❑	❑	❑

Proportion of time in stroke unit	❑	❑	❑
Performance of brain imaging	❑	❑	❑
Performance of imaging of the carotid artery	❑	❑	❑
Performance of screening for swallowing dysfunction	❑	❑	❑
Assessment by physiotherapist	❑	❑	❑
Assessment by occupational therapist	❑	❑	❑
Assessment and follow up of nutritional status	❑	❑	❑
Assessment and management of substance abuse e.g. alcohol	❑	❑	❑
Performance of thrombolytic therapy	❑	❑	❑
Performance of endovascular therapy	❑	❑	❑
Time to thrombolytic therapy	❑	❑	❑
Time to endovascular therapy	❑	❑	❑
Use of antiplatelet therapy in the acute phase of stroke	❑	❑	❑
Use of antiplatelet therapy at discharge	❑	❑	❑
Use of anticoagulants in patients with atrial fibrillation at discharge	❑	❑	❑
Use of lipid lowering medication at discharge	❑	❑	❑
Use of blood pressure lowering at discharge	❑	❑	❑
Length of stay	❑	❑	❑
Death during hospital period	❑	❑	❑
Discharge destination	❑	❑	❑
Death or disability at 1, 3 or 6 months	❑	❑	❑
Long term death or disability	❑	❑	❑
Institutionalisation rates	❑	❑	❑
Complication rates	❑	❑	❑
Quality of life measures	❑	❑	❑

Readmission rates	❑	❑	❑
Prevention therapy adherence rates	❑	❑	❑
Patient satisfaction with services	❑	❑	❑
Provision of information to patients and relatives	❑	❑	❑
Early supported discharge rates	❑	❑	❑
Completeness of etiology information	❑	❑	❑
Other	❑	❑	❑

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11. Development of quality indicators

11.1 Is there a publication describing the selection of quality criteria?

❑ No

❑ Yes

Please provide reference if available

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11.2 Which of the following elements were used to create and select the quality criteria?

	Yes	No	Unknown
Standardized review of evidence	❑	❑	❑
Establishment of a board for guiding development process	❑	❑	❑
Presence of representatives from most or all disciplines treating stroke patients	❑	❑	❑
Involvement of patient organizations	❑	❑	❑
Use of a formal consensus process (eg Delphi)	❑	❑	❑
A priori definitions of quality indicators	❑	❑	❑
Division of quality indicators of process, structure or outcome	❑	❑	❑
Developers made sure to cover several domains of stroke process	❑	❑	❑
Target values were defined in the development of the criteria	❑	❑	❑
Case mix variables were addressed	❑	❑	❑
Inclusion of quality controls (validity of findings checked, completeness assessed)	❑	❑	❑
Availability of documentation standards (eg a guide providing details and definitions on how to collect quality parameters)	❑	❑	❑
Prospective pilot study before launching the quality criteria	❑	❑	❑

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