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Supplement 1: Summarizing tables with key results

Table 1. Grading of outcomes

Scale	OUTCOME	Same level Outcomes	DEFINITIONS
9	Mortality	MRS	Critical for making a decision (included in evidence profile)
8	Complications (Malnutrition)	Respiratory tract infection	
7	Aspiration risk	Feeding strategy	
6	Swallowing function		
5	Length of stay in hospital	Nutritional measures, Weight loss/muscle loss	important, but not critical for making a decision (included in evidence profile)
4	Quality of life		
3	Laboratory parameters linked to malnutrition		
2	Feeding tube failures and adverse events	Withdrawal of tube feeding, Costs	of limited importance for making a decision (not included in evidence profile)

Table 2. Effect of dysphagia compared to no dysphagia on key outcomes

Outcome	Incidence (%)/ Mean±SD		Studies	n (N)	OR [95% CI]/ *MD [95% CI]*	I^2	p value
	Dysphagia	No dysphagia					
Mortality							
• **In-hospital**	19%	1%	[17, 30, 37, 41, 48, 49, 52, 55, 56 40, 55, 56]	10(682884)	9.77 [5.45, 17.50]	96%	< 0.00001
• **3-months**	16%	1%	[15, 17, 19, 32, 49, 51]	5(13546)	9.02 [4.50, 18.09]	73%	< 0.00001
• **1-year**	42%	32%	[20, 37, 46, 49-51, 54]	7(10737)	8.82 [3.56, 21.85]	98%	< 0.00001
Pneumonia	22%	3%	[7, 15-18, 21, 22, 24-29, 34, 35, 37-43, 45-50, 52, 56]	31(767179)	7.45 [6.01, 9.24]	94%	< 0.00001
Tube feeding							
• **Nasogastric tube**	41%	1%	[17, 37]	2(8171)	93.74 [24.33, 361.14]	35%	< 0.00001
• **Percutaneous feeding tube**	9%	0.1%	[17, 26, 37, 47]	4(8446)	71.60 [34.38, 149.11]	0%	< 0.00001
mRS							
• **mRS 0, 1**	6%	30%	[17, 37]	2(5582)	0.20 [0.11, 0.35]	83%	< 0.00001
• **mRS ≥2**	76%	55%	[15, 17, 37, 48]	3(17858)	2.34 [1.24, 4.40]	98%	0.08
• **mRS 4,5**	52%	18%	[37]	1(5012)	5.03 [4.43, 5.72]	NA	< 0.00001
LOS							
• **overall [days]**	12.1±9.7	8.4±6.2	[7, 15, 17, 20, 23, 26, 30, 37, 40, 46-49, 56, 57, 126]	14(697614)	*4.72 [3.53, 5.91]*	99%	< 0.00001
• **Stroke-unit [days]**	4.4±3.0	2.7±2.4	[17]	1(570)	*1.70 [1.12, 2.28]*	NAs	< 0.00001
Discharge status							
• **Discharged home**	17%	67%	[17, 28, 37, 40, 47, 49, 56, 126]	8(678519)	0.17 [0.09, 0.35]	100%	< 0.00001
• **Discharged to Institution/Palliative**	49%	26%	[7, 17, 37, 46-48, 51, 56]	7(665094)	3.90 [2.93, 5.21]	81%	< 0.00001
• **Discharged to long term care**	15%	5%	[37, 56]	2(663721)	1.95 [0.71, 5.32]	100%	0.19
• **Readmission,**	42%	54%	[49]	1(395)	0.62 [0.42,	NA	0.02

1 year					0.93]		

CI: Confidence intervals; FOIS: Functional oral intake scale; I^2: Heterogeneity; LOS, Length of stay in hospital; MD: Mean difference; n: Number of studies; N: Number of patients; NIHSS: National Institute of Health Stroke Scale; p: Statistical significance value; OR: Odds Ratio; SD: Standard deviation

Table 3. Effect of screening compared to no screening on key outcomes

Outcome	Incidence (%)/ Mean±SD		Studies	n (N)	OR [95% CI]/ *MD [95% CI]*	I^2	P value
	Screening	No Screening					
Mortality							
• **In-hospital**	2%	4%	[40, 71-73]	4(20806)	0.67 [0.45, 1.02]	57%	0.06
• **1 month**	10%	31%	[74, 76, 77]	3(66162)	0.57 [0.12, 2.80]	99%	0.49
Pneumonia	7%	10%	[15, 40, 47, 71-74, 76-80]	11(536650)	0.55 [0.36, 0.83]	99%	0.004
Nasogastric tube, insertion	44%	53%	[47, 71, 73]	3(459)	0.86 [0.51, 1.45]	0%	0.58
Endotracheal tube insertion	7%	9%	[71, 73]	2(260)	0.66 [0.27, 1.63]	0%	0.37
LOS [days]	7.2±6.4	6.2±5.3	[40, 47, 71-73]	5(21005)	*0.02 [-2.22, 2.26]*	99%	0.99
Discharge							
• **Discharged home**	29%	33%	[40, 77]	2(20348)	0.84 [0.79, 0.90]	0%	< 0.00001
• **Discharged to Institution**	20%	19%	[77]	1(2334)	1.08 [0.86, 1.35]	NA	0.53
• **Skilled nursing facility**	14%	11%	[77]	1(2334)	1.27 [0.97, 1.66]	NA	0.09
• **Hospice**	2%	3%	[77]	1(2334)	0.78 [0.43, 1.39]	NA	0.39
• **Other hospitals**	6%	5%	[77]	1(2334)	1.28 [0.86, 1.92]	NA	0.23

CI: Confidence intervals; I^2: Heterogeneity; LOS, Length of stay in hospital; MD: Mean difference; n: Number of studies; N: Number of patients; p: Statistical significance value; OR: Odds Ratio; SD: Standard deviation; UTI: Urinary tract infection

Table 4. Effect of early screening compared to late screening on key outcomes

Outcome	Incidence (%)/ Mean±SD		Studies	n (N)	OR [95% CI]/ *MD [95% CI]*	I^2	p value
	Early Screening	Late Screening					
Mortality							
• **Overall**	15%	23%	[74, 81-84]	7(144307)	0.62 [0.43, 0.91]	99%	0.01
• **Hospital/ 7 days**	5%	6%	[81-83]	4(55969)	0.74 [0.61, 0.89]	75%	0.002
• **1 month**	11%	16%	[74, 83, 84]	5(140614)	0.66 [0.42, 1.02]	99%	0.06
• **1 year**	26%	27%	[83]	2(52276)	0.94 [0.90, 0.97]	0%	0.0009
Pneumonia	9%	15%	[15, 74, 80-82, 84-89]	10(96367)	0.45 [0.35, 0.58]	83%	< 0.00001
LOS, days	23.8±9.5	27.6±9.2	[81-84, 90]	6(56085)	*-2.27 [-3.12, -1.43]*	92%	< 0.00001
Barthel Index Score, discharge	17±43	12±28	[84]	1(116)	*5.00 [-8.21, 18.21]*	NA	0.46
Discharge							
• **Discharged home**	57%	53%	[83]	2(52276)	1.16 [1.08, 1.26]	79%	< 0.0001
• **Readmission**	2%	6%	[85]	1(138)	0.35 [0.06, 2.19]	NA	0.69
mRS							
• **mRS, 4-5**	28%	39%	[81]	1(3309)	0.59 [0.50, 0.71]	NA	0.00001

CI: Confidence intervals; I^2: Heterogeneity; LOS, Length of stay in hospital; MD: Mean difference; n: Number of studies; N: Number of patients; p: Statistical significance value; PEG: Percutaneous endoscopic gastrostomy; OR: Odds Ratio; SD: Standard deviation; LOS: Length of stay

Table 5. Effect of clinical bedside assessment compared to instrumental assessment on key outcomes

Outcome	Incidence (%)		Studies	n (N)	OR [95% CI] / *MD [95% CI]*	I^2	p value
	Clinical bedside assessment	Instrumental assessment					
Mortality	10.5%	7.3%	[135]	1(440)	1.49 [0.76, 2.90]	NA	0.24
Pneumonia	12.3%	6.4%	[135]	1(440)	2.06 [1.05, 4.04]	NA	0.04
Discharge, home	43.6%	46.4%	[135]	1(440)	0.90 [0.62, 1.30]	NA	0.57
Discharge, on standard diet	51.1%	65.6%	[135]	1(378)	0.47 [0.31, 0.71]	NA	0.004
LOS [days]	17.3±15.2	23.7±20.2	[135]	1(440)	*-6.33 [-9.67, -2.99]*	NA	0.0002

CI: Confidence intervals; I^2: Heterogeneity; LOS: Length of stay in hospital; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; OR: Odds Ratio

Table 6. Effect of instrumental assessment with FEES compared to instrumental assessment with VFSS on key outcomes.

Outcome	Incidence (%)		Studies	n (N)	OR [95% CI]/ *MD [95% CI]*	I^2	P value
	VFSS	FEES					
Pneumonia	29.2%	4.8%	[140]	1(45)	8.24 [0.92, 73.79]	NA	0.06
PEG	2.6%	23.8%	[140]	1(99)	0.08 [0.01, 0.47]	NA	0.005

CI: Confidence intervals; FEES: fiberoptic endoscopic evaluation of swallowing; I^2: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; PEG: Percutaneous endoscopic gastrostomy; OR: Odds Ratio

Table 7. Effect of complementary and standard assessment in patients with acute or subacute stroke

Outcome	Incidence (%)/ Mean±SD		Studies	n (N)	OR [95% CI]/ *MD [95% CI]*	I^2	p value
	Complementary and standard assessment	Standard assessment					
Mortality	13.5%	19.6%	[141]	1(311)	0.64 [0.35, 1.18]	NA	0.15
Pneumonia	25.7%	21.5%	[141]	1(311)	1.26 [0.75, 2.14]	NA	0.38
Independence							
• **At home**	48.6%	44.8%	[141]	1(311)	1.17 [0.75, 1.83]	NA	0.50
• **At residential care**	43.2%	45.4%	[141]	1(311)	0.92 [0.59, 1.43]	NA	0.70
• **At public hospital**	8.1%	9.8%	[141]	1(311)	0.81 [0.37, 1.78]	NA	0.60
Length of stay	7±5.2	6±5.2	[141]	1(311)	*1.00 [-0.16, 2.16]*	NA	0.09
FOIS	6.2±1.2	6±1.3	[141]	1(311)	*0.20 [-0.08, 0.48]*	NA	0.16

CI: Confidence intervals; I^2: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; OR: Odds Ratio; SD: Standard deviation; FOIS: Functional oral intake scale

Table 8. Effect of consistency modification on key outcomes

Outcome	Incidence %		Studies	n (N)	RR [95% CI]/ *MD [95% CI]*	$I^{2,}$	p value
	Consistency modification	Control					
Pneumonia							
• RCT	0.0%	20.0%	[154, 156, 158]	4(100)	0.19 [0.03, 1.40]	0%	0.1
Penetration							
• RCT	0.0%	13.1%	[153]	1(122)	0.06 [0.00, 1.00]	NA	0.05
Aspiration							
• RCT	21.3%	45.7%	[153-155]	3(188)	0.51 [0.14, 1.77]	90%	0.29
LOS in hospital (days)							
• RCT	24±9	34±12	[158]	1(64)	*-9.58 [-15.41, -3.76]*	19%	0.001
Fluid intake (ml)							
• Overall	1179±235	1612±455	[156, 157, 160]	3(77)	*-133.22 [-541.90, 275.46]*	94%	0.52
• RCT	745±164	649±172	[156, 157]	2(38)	*140.48 [-41.56, 322.51]*	68%	0.13
• NRCT	1589±302	2575±737	[160]	1(39)	*-986.00 [-1330.71, -641.29]*	NA	<0.0001
• **Energy intake, Kcal/kg/day**							
• NRCT	19.4±6.2	22.3±9.0	[161]	1(52)	*-2.90 [-7.09, 1.29]*	NA	0.18
• **Protein intake, g/kg/day**							
• NRCT	0.71±0.29	0.90±0.31	[161]	1(68)	*-0.19 [-0.34, -0.04]*	NA	0.02

CI: Confidence intervals; I^2: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; p: Statistical significance value; RR: Risk Ratio; SD: Standard deviation; RCT: Randomized controlled trial; NRCT: Non-Randomized Controlled Trial

Table 9. Effect of behavioural therapy on key outcomes and dysphagia scores

Outcome	Mean±SD/ Incidence (%)		Studies	n (N)	RR [95% CI]/ *MD [95% CI]*	I^2	P value
	Behaviour	Control					
Mortality							
• RCT	15.1%	10.7%	[25, 170, 171]	3(505)	1.47 [0.32, 6.78]	71%	0.62
mRS, RCT							
• mRS ≥3	50.5%	48.0%	[171]	1(306)	1.05 [0.82, 1.34]	NA	0.69
Pneumonia							
• Overall	18.4%	24.5%	[25, 170, 171, 173, 183, 184]	6(677)	0.57 [0.43, 0.75]	0%	< 0.0001
• EMST, RCT	11.6%	19.0%	[173, 183, 184]	3(196)	0.58 [0.24, 1.41]	22%	0.23
• Swallowing exercises, RCT	21.3%	26.6%	[25, 170, 171]	3(481)	0.56 [0.41, 0.76]	0%	0.0002
LOS							
• Swallowing exercise, RCT	19.2±1.2	21.4±12.4	[171]	1(306)	*-2.20 [-4.61, 0.21]*	NA	0.07
Tube feeding							
• Tube removal	63.6%	28.6%	[193, 194]	2(43)	2.16 [0.75, 6.17]	43%	0.15
Improvement in dysphagia scores							
• Overall	6.4±3.6	4.1±3.5	[101, 165, 172, 173, 175-177, 181, 185-190, 192-194]	18(510)	*1.18 [0.78, 1.57]*	70%	<0.00001
• RCT	5.0±2.9	3.0±2.8	[101, 165, 172, 173, 175-177, 181, 185-190, 192]	16(440)	*0.97 [0.64, 1.30]*	68%	<0.00001
• EMST, RCT	1.4±1.3	0.7±1.4	[165, 172, 173, 185]	4(108)	*0.99 [0.51, 1.47]*	16%	< 0.0001
• Swallowing exercises, overall	7.6±4.2	5.1±4.1	[101, 175-177, 181, 186-190, 192-194]	14(402)	*1.01 [0.67, 1.34]*	73%	<0.00001
• Swallowing exercises, RCT	6.1±3.4	3.9±3.3	[101, 175-177, 181, 186-190, 192]	12(332)	*1.19 [0.68, 1.69]*	73%	<0.00001
• Swallowing exercises, NRCT	15.5±8.4	10.5±7.3	[193, 194]	2(70)	*3.11 [-0.12, 6.34]*	40%	0.06

CI: Confidence intervals; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; NRCT: Non-randomized controlled trial; p: Statistical significance value; SD: Standard Deviation; MD: Mean Difference; RR: Risk Ratio; EMST: Expiratory muscle strength training; RCT: Randomized controlled trial; NRCT: Non-Randomized Controlled Trial

Table 10. Effect of acupuncture on key outcomes

Outcome	Mean±SD/ Incidence (%)		Studies	n (N)	RR [95% CI]/ *(S)MD [95% CI]*	I^2	p value
	Acupuncture	Control					
Dysphagia at end of trial	20.0%	39.6%	[196] [198-208, 210-214, 216, 218-222]	23(2177)	0.51 [0.41, 0.63]	58%	< 0.00001
Dysphagia score, overall*							
• Improve-ment	4.0±0.8	2.8±0.9	[197, 199, 217]	3(292)	*1.05 [0.45, 1.65]*	81%	0.0006
• Post inter-vention	1.5±0.7	2.1±0.9	[197, 199, 208, 212, 217]	5(443)	*-0.63 [-1.12, -0.14]*	84%	0.01
Pneumonia	3.3%	8.3%	[200]	1(120)	0.40 [0.08, 1.98]	NA	0.26
SQoL	197±19	165±20	[200]	1(120)	*32.0 [24.99, 39.01]*	NA	<0.00001
Nasal feeding tube removal	89.5%	50.0%	[198]	1(74)	1.79 [1.27, 2.53]	NA	0.0009
BI	78±11	63±12	[209, 217]	2(140)	*7.40 [-12.39, 27.19]*	95%	0.46
Adverse effects							
• Pain	1.7%	0.0%	[217]	1(120)	3.00 [0.12, 72.20]	NA	0.5
• Hema-toma	3.3%	0.0%	[217]	1(120)	5.00 [0.25, 102.00]	NA	0.3
• Discom-fort	11.7%	8.3%	[217]	1(120)	1.40 [0.47, 4.17]	NA	0.55

*: Standard Mean Difference; CI: Confidence intervals; I^2: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; SD: Standard Deviation; MD: Mean Difference; SQoL: Swallowing quality of life; RR: Risk ratio; BI: Barthel Index; RCT: Randomized controlled trial; NRCT: Non-Randomized Controlled Trial

Table 11. Effect of early compared to late initiation of oral nutritional therapy on key outcomes

Outcome	Incidence (%)	Studies	n (N)	RR [95% CI]/	I^2	p value

	Early nutrition	Late nutrition			*MD [95% CI]*		
Mortality							
• RCT	11.7%	12.6%	[223-226]	4(4337)	0.88 [0.57, 1.37]	26%	0.57
Pneumonia							
• RCT	6.4%	5.8%	[223]	1(4023)	1.12 [0.88, 1.42]	NA	0.38
mRS, RCT							
mRS, 0, 1	23.4%	23.5%	[223]	1(4023)	1.00 [0.89, 1.11]	NA	0.94
mRS, 0-2	40.4%	41.1%	[223]	1(4023)	0.98 [0.91, 1.06]	NA	0.68
Recurrent stroke							
• RCT	2.5%	2.1%	[223]	1(4023)	1.16 [0.77, 1.73]	NA	0.48
Infections							
• RCT	8.5%	10.0%	[223]	1(4023)	0.86 [0.71, 1.04]	NA	0.12
Pressure sores							
• RCT	0.7%	1.3%	[223]	1(4023)	0.57 [0.31, 1.08]	NA	0.09
GIT haemorrhage							
• RCT	1.4%	0.9%	[223]	1(4023)	1.55 [0.86, 2.79]	NA	0.15
Length of stay, days							
• RCT	31.1±46.5	31.4±43.2	[223-226]	4(4289)	*0.93 [-1.05, 2.91]*	0%	0.36
Weight, change, kg							
• RCT	0.0±1.7	-1.1±2.1	[225-227]	4(315)	*1.03 [0.17, 1.89]*	91%	0.02
Energy, kJ/kg							
• RCT	61.6±20.8	49.7±15.0	[225, 227]	5(264)	*8.25 [1.97, 14.53]*	81%	0.01
Protein intake, g/kg							
• RCT	0.9±0.3	0.7±0.3	[225, 227]	5(264)	*0.21 [0.01, 0.41]*	88%	0.04

CI: Confidence intervals; $I^{2,}$,p: Heterogeneity; n: Number of studies; N: Number of patients; MD: Mean differecne; NA: Not applicable; p: Statistical significance value; RR: Risk Ratio; GIT: Gastrointestinal tract; RR: Risk ratio; RCT: Randomized controlled trial; NRCT: Non-Randomized Controlled Trial

Table 12. Effect of early compared to late or restrictive enteral or parenteral nutrition therapy on key outcomes

Outcome	Incidence (%)		Studies	n (N)	RR [95% CI]/ *MD [95% CI]*	I^2	p value
	Early Enteral or Parenteral	Late/ Restrictive Enteral or Parenteral					
Mortality							
• RCT	42.4%	48.1%	[229]	1(859)	0.88 [0.76, 1.02]	NA	0.09
Pneumonia							
• RCT	28.4%	29.5%	[229, 230]	2(1005)	0.97 [0.80, 1.17]	0%	0.75
MRS (RCT)							
• mRS, 0, 1	5.7%	7.0%	[229, 230]	2(981)	0.84 [0.36, 1.94]	65%	0.68
• mRS, 0-2	9.3%	10.2%	[229]	1(859)	0.91 [0.61, 1.37]	NA	0.65
Recurrent stroke							
• RCT	3.5%	5.3%	[229]	1(859)	0.65 [0.35, 1.24]	NA	0.19
Infections							
• RCT	23.8%	27.3%	[229, 230]	2(1005)	0.80 [0.55, 1.18]	65%	0.27
Pressure sores							
• RCT	2.8%	2.3%	[229]	1(859)	1.20 [0.53, 2.75]	NA	0.66
Malnutrition							
• RCT	27.1%	48.3%	[230]	1(128)	0.56 [0.35, 0.90]	NA	0.02
GIT haemorrhage							
• RCT	5.1%	2.6%	[229]	1(859)	2.00 [0.98, 4.08]	NA	0.06
Length of stay, days							
• RCT	45±58	44±50	[229]	1(859)	*1.00 [-6.24, 8.24]*	NA	0.79
BI							
• RCT	46.7±8.8	44.4±9.3	[230]	1(146)	*2.30 [-0.64, 5.24]*	NA	0.13
Living at home							
• RCT	35.7%	31.6%	[229]	1(859)	1.13 [0.93, 1.36]	NA	0.21
Living in Rehabilitation/ institution							
• RCT	21.9%	20.0%	[229]	1(859)	1.10 [0.84, 1.42]	NA	0.49
Nasogastric tube							
• RCT	7.0%	5.3%	[229]	1(859)	1.31 [0.77, 2.21]	NA	0.32
PEG							
• RCT	3.3%	2.3%	[229]	1(859)	1.40 [0.63, 3.12]	NA	0.41

CI: Confidence intervals; I^2,p: Heterogeneity; n: Number of studies; N: Number of patients; MD: Mean difference; NA: Not applicable; p: Statistical significance value; RR: Risk Ratio; BI: Barthel Index; RCT: Randomized controlled trial; NRCT: Non-Randomized Controlled Trial

Table 13. Effects of oral health interventions on key outcomes

Outcome	Incidence %		Studies	n (N)	RR [95% CI]/ *(S)MD [95% CI]*	I^2	p value
	Oral health	Control					
Mortality							
• Overall	17.4%	29.8%	[84, 238]	3(349)	0.66 [0.45, 0.96]	0%	0.03
• RCT	8.7%	14.0%	[238]	1(203)	0.62 [0.28, 1.38]	NA	0.24
• NRCT	32.8%	47.7%	[84]	2(146)	0.67 [0.44, 1.03]	0%	0.07
In-patients							
• RCT	8.7%	11.0%	[238]	1(203)	0.79 [0.34, 1.83]	NA	0.59
1 month							
• RCT	NR	NR		NR	NR	NR	NR
• NRCT	12.1%	25.0%	[84]	2(146)	0.48 [0.22, 1.05]	0%	0.07
3 months							
• RCT	8.7%	14.0%	[238]	1(203)	0.62 [0.28, 1.38]	NA	0.24
6 months							
• RCT	NR	NR		NR	NR	NR	NR
• NRCT	32.8%	47.7%	[84]	2(146)	0.67 [0.44, 1.03]	0%	0.07
Pneumonia							
• Overall	8.7%	13.9%	[84, 238-242]	7(2110)	0.39 [0.17, 0.91]	53%	0.03
• RCT	0.6%	5.6%	[238-240]	3(284)	0.14 [0.02, 1.11]	NA	0.06
• NRCT	10.0%	15.2%	[84, 241, 242]	4(1826)	0.47 [0.21, 1.06]	51%	0.07
Tube feeding							
• Overall	18.1%	29.1%	[84, 237, 242]	4(1853)	0.62 [0.48, 0.79]	36%	0.0001
• RCT	41.4%	100.0%	[84, 237, 242]	1 (51)	0.43 [0.28, 0.65]	NA	< 0.0001
• NRCT	17.5%	27.2%	[84, 242]	3 (1802)	0.68 [0.57, 0.81]	0%	< 0.0001
Length of stay							
• RCT	NR	NR		NR	NR	NR	NR
• NRCT	11.7±9.7	16.8±7.6	[84, 243]	2(200)	*-3.21 [-5.26, -1.16]*	0%	0.002
• **Oral Health**							
• Overall*	NA	NA	[237, 239-241]	6(235)	*-1.27 [-2.26, -0.28]*	93%	0.01
• **Plaque index**							
• RCT	1.4±1.5	7.4±2.6	[239, 240]	3(175)	*-2.98 [-4.98, -0.98]*	98%	0.003
• **Gingival bleeding index**							
• RCT	8.7±9.3	17.7±21.9	[240]	2(81)	*-8.85 [-17.77, 0.07]*	27%	0.05

I^2: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; RR: Risk ratio; RCT: Randomized controlled trial; NRCT: Non-Randomized Controlled Trial

Table 14: Effect of different pharmaceutical agents on key outcomes

Outcome	Incidence %		Studies	n (N)	RR [95% CI], *MD [95% CI]*	I^2	P value
	Drugs	Control					
Mortality							
ACE inhibitors							
• Overall	10.3%	10.5%	[257, 258, 268, 275]	4(6733)	0.96 [0.54, 1.69]	75%	0.88
• RCTs: vs Control	10.6%	11.0%	[257, 258, 268]	3(6244)	0.97 [0.46, 2.04]	83%	0.93
• NRCT: vs Control	4.8%	5.6%	[275]	1(489)	0.86 [0.37, 1.99]	NA	0.72
TRPV-agonists: RCT	0.0%	2.9%	[254]	1(70)	0.33 [0.01, 7.91]	NA	0.5
Dopaminergic drugs: RCT	15.2%	42.9%	[257]	1(68)	0.35 [0.14, 0.86]	NA	0.02
Antibiotics: RCTs	16.1%	15.3%	[250, 252, 255, 256, 263, 264, 266]	7(4301)	1.05 [0.87, 1.26]	16%	0.61
Metoclopramide: RCT	26.7%	40.0%	[265]	1(60)	0.67 [0.32, 1.39]	NA	0.28
Pneumonia							
ACE inhibitors							
• Overall	4.1%	7.6%	[258, 260, 271-275, 278, 279]	12(10611)	0.60 [0.51, 0.70]	61%	< 0.00001
• RCTs vs control (fatal)	4.4% (2.2%)	5.2% (2.2%)	[258, 260]	2(6176) 2(6176)	0.86 [0.69, 1.06] (1.02 [0.74, 1.42])	61% (79%)	0.16 (0.89)
• NRCTs vs control	3.6%	11.4%	[271, 274, 275, 278]	4(1491)	0.41 [0.26, 0.64]	0%	< 0.0001
• NRCTs: vs other antihypertensive drugs	3.9%	10.6%	[271-274, 279]	6(2944)	0.38 [0.28, 0.52]	0%	< 0.00001
TRPV-agonists							
• Overall	9.6%	32.7%	[254, 277]	2(104)	0.31 [0.15, 0.66]	0%	0.002
• RCT: Vs Control	0.0%	2.9%	[254]	1(70)	0.33 [0.01, 7.91]	NA	0.50
• NRCT: Vs Control	29.4%	94.1%	[277]	1(34)	0.31 [0.15, 0.66]	NA	0.002

Outcome	Incidence %		Studies	n (N)	RR [95% CI], *MD [95% CI]*	I^2	P value
	Drugs	Control					
Dopaminergic drugs: RCT	6.0%	27.5%	[259]	1(163)	0.22 [0.09, 0.55]	NA	0.001
Antibiotics: RCTs	10.3%	11.1%	[252, 255, 256, 263, 264, 266]	6(4201)	0.93 [0.78, 1.10]	17%	0.40
Metoclopramide: RCT	26.7%	86.7%	[265]	1(60)	0.31 [0.17, 0.57]	NA	0.0002
mRS							
Antibiotics: RCTs							
• mRS 0-2	46.0%	45.4%	[250, 256, 264, 266]	3(3946)	1.02 [0.83, 1.25]	56%	0.85
• mRS 3-6	43.3%	45.4%	[263, 264, 266]	3(2825)	0.97 [0.91, 1.02]	31%	0.25
Length of stay in hospital, days							
• ACE inhibitor: RCT	37±22	51±36	[257]	1(68)	*-14.00 [-28.09, 0.09]*	NA	0.05
• Dopaminergic: RCT	37±22	51±36	[257]	1(68)	*-14.00 [-28.09, 0.09]*	NA	0.05
• Antibiotics: RCT	12.5±5.9	10.2±5.8	[256, 266]	2(3755)	*3.49 [-3.37, 10.35]*	100%	0.32
Aspiration							
• ACE inhibitors: RCT	26.2%	91.7%	[269]	1(54)	0.29 [0.17, 0.49]	NA	<0.00001
• Dopaminergic drugs: RCT	25.9%	91.7%	[269]	1(39)	0.30 [0.16, 0.58]	0%	0.0003
Latency of swallowing reflex							
• TRPV agonist							
• Change							
• Overall	-7.4±1.2	-0.5±7.2	[253, 254, 276]	3(174)	*-5.14 [-7.86, -2.41]*	100%	0.80
• RCT	-7.9±1.5	-0.6±9.4	[253, 254]	2(134)	*-6.68 [-15.75, 2.39]*	90%	0.15
• NRCT	-5.5±0.0	0.0±0.01	[276]	1(40)	*-5.50 [-5.50, -5.50]*	NA	<0.00001
Upper oesophageal sphincter opening time, sec							

Outcome	Incidence %		Studies	n (N)	RR [95% CI], *MD [95% CI]*	I^2	P value
	Drugs	Control					
• TRPV agonist	0.9±0.1	1.0±0.0	[262]	2(50)	*-0.08 [-0.13, -0.04]*	41%	0.0002
Laryngeal vestibule closure time, sec							
• TRPV agonist	0.3±0.0	0.4±0.0	[121, 262]	3(116)	*-0.10 [-0.12, -0.08]*	70%	<0.00001
Hyoid bone maximum anterior extension time, sec							
• TRPV agonist	0.5±0.0	0.6±0.1	[121, 262]	3(146)	*-0.15 [-0.16, -0.13]*	0%	<0.00001
Latency of Swallowing reflex							
• Dopaminergic drugs: RCT	2.9±0.8	8.3±1.2	[270]	1(54)	*-5.40 [-5.94, -4.86]*	NA	<0.00001
Swallows/min							
• TRPV agonist							
• Change: RCT	3.3±2.5	0.0±0.05	[254]	1(70)	*3.30 [2.47, 4.13]*	NA	<0.00001

ACE: Angiotensin converting enzyme; CI: Confidence intervals; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; MD: Mean difference;NA: Not applicable; NRCT: Non-Randomized Controlled Trial; p: Statistical significance value; RCT: Randomized Controlled Trial; RR: Risk ratio; TRPV: transient receptor potential vanilloid

Table 15: Effect of different neurostimulation modalities on key outcomes

Outcome	Mean±SD		Studies	n (N)	RR [95% CI]/ *(S)MD [95% CI]*	I^2	p value
	Stimulation	Control					
Imprevement in dysphagia score							
TES							
• Overall	5.8±2.7	3.5±2.6	173, 282, 284, 287, 294-296, 299, 301, 304, 307, 308, 312-317, 319	22(868)	*0.90 [0.62, 1.18]*	69%	<0.00001
• RCT	6.2±2.8	3.7±2.7	173, 282, 284, 287, 294-296, 299, 301, 304, 307, 308, 312-315	19(746)	*0.90 [0.60, 1.19]*	70%	<0.00001
• NRCT	3.7±1.9	1.8±1.9	316, 317, 319	3(122)	*1.14 [-0.13, 2.41]*	78%	0.08
rTMS							
• Overall	9.6±6.1	4.7±5.1		11(236)	*1.33 [0.51, 2.16]*	85%	0.002
• RCT	10.5±6.4	5.3±5.5	285, 289-291, 295, 297, 298, 300	10(212)	*1.51 [0.60, 2.42]*	85%	0.001
• NRCT	0.8±2.6	0.7±2.5	318	1(24)	*0.04 [-0.76, 0.84]*	NA	0.93
tDCS							
• Overall	2.8±2.3	2.0±1.8	281, 292, 293, 303, 306, 310	8(196)	*0.75 [0.38, 1.12]*	26%	<0.0001
• RCT	2.8±2.3	2.0±1.8	281, 292, 293, 303, 306, 310	8(196)	*0.75 [0.38, 1.12]*	26%	<0.0001
PES, Non-tracheostomised							
• Overall	2.3±1.9	1.6±2.2	283, 288, 297, 302, 309	5(204)	*0.77 [-0.06, 1.60]*	80%	0.07
• RCT	2.3±1.9	1.6±2.2	283, 288, 297, 302, 309	5(204)	*0.77 [-0.06, 1.60]*	80%	0.07
PES, tracheostomised							
• Overall	5.6±3.9	5.2±4.3	286, 305	2(83)	*0.25 [-0.19, 0.69]*	0%	0.27
• RCT	5.6±3.9	5.2±4.3	286, 305	2(83)	*0.25 [-0.19, 0.69]*	0%	0.27
Mortality, RCT							
• 2 weeks, PES	3.5%	1.5%	283, 288	2(154)	1.66 [0.22, 12.37]	0%	0.62

• 3 months, PES	13.8%	12.0%	[283, 288, 309]	3(231)	1.10 [0.55, 2.18]	0%	0.78
mRS, RCT							
• rTMS	1.0±0.7	2.5±1.3	[285]	1(38)	*-1.50 [-2.29, -0.71]*	0%	0.0002
• PES	3.8±1.1	4.2±1.0	[283, 286]	2(177)	*-0.33 [-0.63, -0.02]*	0%	0.04
Pneumonia, RCT							
• TES	5.8%	8.5%	[173, 314]	2(99)	0.75 [0.19, 2.95]	NA	0.68
• tDCS	37.9%	53.3%	[306]	1(59)	0.71 [0.40, 1.26]	NA	0.24
• PES	7.6%	11.5%	[283, 286]	2(209)	0.66 [0.29, 1.52]	0%	0.33
BI							
• rTMS, Overall	76.8±7.9	52.8±14.5	[285, 289, 290, 318]	5(110)	*29.54 [25.82, 33.26]*	87%	< 0.00001
• rTMS, RCT	79.8±5.1	46.9±12.7	[285, 289, 290]	4(86)	*31.57 [27.75, 35.39]*	73%	< 0.00001
• rTMS, NRCT	64.0±20.0	70.0±20.0	[318]	1(24)	*-6.00 [-22.00, 10.00]*	NA	0.46
• PES, RCT	36.1±30.5	27.0±25.7	[283, 288]	2(154)	*-0.34 [-1.19, 0.51]*	74%	0.43
LOS, Hospital (d), RCT							
• tDCS	16.2±6.8	13.4±5.1	[306]	1(59)	*2.80 [-0.28, 5.88]*	NA	0.07
• PES	32.4±20.7	35.3±22.1	[283, 305]	3(192)	*-4.23 [-12.11, 3.66]*	33%	0.29
LOS, ICU (d), RCT							
• tDCS	6.7±4.4	7.0±3.3	[306]	1(59)	*-0.30 [-2.29, 1.69]*	NA	0.77
• PES	38.2±14.9	38.8±19.7	[306]	1(59)	*-0.60 [-14.45, 13.25]*	NA	0.93
Decannulation							
• Tracheotomised patients, PES, Overall	59.0%	7.5%	[286, 305, 320]	3(145)	5.43 [2.42, 12.16]	0%	< 0.0001
• Tracheotomised patients, PES, RCT	58.2%	11.4%	[286, 305]	2(99)	4.64 [2.00, 10.79]	0%	0.004
• Tracheotomised patients, PES, NRCT	60.9%	0.0%	[320]	1(46)	29.00 [1.83, 459.04]	NA	0.02
Feeding Tube removal							
• TES, RCT	50.0%	14.3%	[294]	1(19)	3.50 [0.52,	NA	0.2

					23.42]		
• PES, RCT	50.0%	28.6%	[309]	1(30)	1.75 [0.67, 4.58]	NA	0.25
Quality of Life, change from baseline, RCT							
• Swallowing QoL, TES	26.2±18.2	7.2±17.1	[304, 312]	3(106)	*18.02 [11.41, 24.63]*	37%	<0.00001

CI: Confidence intervals; tDCS: transcranial Direct Current Stimulation; I^2: Heterogeneity; n: Number of studies; N: Number of patients; TES: Transcutaneous Electrical Stimulation; NRCT: RCT: Non-randomized controlled trial (Cohort, before after, case-control studies); p: Statistical significance value; PES: Pharyngeal Electrical Stimulation; RCT: Randomized controlled trial; RR: Risk ratio SD: Standard Deviation; SMD: Standard Mean Difference; rTMS: repetitive Transcranial Magnetic Stimulation; BI: Barthel Index; LOS: Length of stay; ICU: Intensive care unit; NRCT: Non-Randomized Controlled Trial; RCT: Randomized Controlled Trial;

Table 16. Summary table of PICO-questions and recommendations

PICO-question	Recommendations/Expert Opinions
Dysphagia Screening	
1. In patients with acute stroke does screening compared to no screening for dysphagia improve functional outcome and/or survival, reduce aspiration risk, reduce length of hospital stay, reduce adverse events and complications, have an effect on nutritional status, and have an effect on quality-of-life? 2. In patients with acute stroke, does early dysphagia screening compared to no screening or late screening, improve functional outcome and/or survival, reduce aspiration risk, length of hospital stay, adverse events and complications and have an effect on nutritional status and on quality of life? 3. In patients with acute stroke does dysphagia screening with multiple consistencies compared to screening with single consistencies improve functional outcome and/or survival, reduce aspiration risk, length of hospital stay, adverse events and complications, and have an effect on nutritional status and/or quality of life?	Recommendation 1: In all patients with acute stroke, we recommend a formal dysphagia screening test to prevent post-stroke pneumonia and decrease risk of early mortality. We recommend to screen the patients as fast as possible after admission. For screening, either water-swallow-tests or multiple consistency tests may be used. Quality of evidence: Moderate ⊕⊕⊕ Strength of recommendation: Strong for intervention ↑↑ Recommendation 2: In patients with acute stroke, we recommend no administration of any food or liquid items, including oral medication, until a dysphagia screening has been done and swallowing was judged to be safe. Quality of evidence: Moderate ⊕⊕⊕ Strength of recommendation: Strong for intervention ↑↑
Nutritional Screening	
1. In patients with post-stroke dysphagia does nutritional screening/assessment compared to no nutritional screening/assessment improve functional outcome and/or survival, reduce aspiration risk, reduce length of hospital stay, reduce adverse events and complications, improve swallowing status/function, have an effect on nutritional status, and have an effect on quality of life?	Expert opinion: There is consensus among the guideline group (15/15) that patients with acute stroke should be screened for nutritional risk within the first days after hospital admission using validated screening tools.
Dysphagia Assessment	
1. In patients with acute and/or subacute stroke does full clinical and instrumental assessment compared to no assessment improve functional outcome and/or survival, reduce aspiration risk, reduce length of hospital stay, reduce adverse events and complications, have an effect on nutritional status, and/or have an effect on quality	Recommendation 3: We suggest a dysphagia assessment in all stroke patients failing a dysphagia screening and/or showing other clinical predictors of post-stroke dysphagia, in particular a severe facial palsy, severe dysarthria, severe aphasia or an overall severe neurological deficit (NIH-SS ≥ 10 points). Dysphagia assessment should be done as soon as possible. In addition to the clinical swallow examination,

of life? 2. In patients with acute and /or subacute stroke does early assessment for dysphagia compared to late assessment improve functional outcome and/or survival, reduce aspiration risk, reduce length of hospital stay, reduce adverse events and complications, have an effect on nutritional status, and/or have an effect on quality of life? 3. In patients with acute and /or subacute stroke do repeated assessments compared to single assessments improve functional outcome and/or survival, reduce aspiration risk, reduce length of hospital stay, reduce adverse events and complications, have an effect on nutritional status, and/or have an effect on quality of life? 4. In patients with stroke does clinical bedside assessment compared to instrumental assessment improve functional outcome and/or survival, reduce aspiration risk, reduce length of hospital stay, reduce adverse events and complications, have an effect on nutritional status, and/or have an effect on quality of life? 5. In patients with acute and/or subacute stroke does instrumental assessment with VFSS compared to FEES improve functional outcome and/or survival, reduce aspiration risk, reduce length of hospital stay, reduce adverse events and complications, have an effect on nutritional status, and/or have an effect on quality of life? 6. In patients with acute and / or subacute stroke do complementary assessments to clinical assessments (i.e. spirometry, EMG) compared to standard clinical assessment improve functional outcome and/or survival, reduce aspiration risk, reduce length of hospital stay, reduce adverse events and complications, have an effect on nutritional status, and/or have an effect on quality of life?	VFSS, or, preferentially, FEES should be available. Quality of evidence: Low ⊕⊕ Strength of recommendation: Weak for intervention ↑?4 Recommendation 4: We suggest that in acute stroke patients swallowing of tablets should routinely be evaluated as part of dysphagia assessment in addition to assessing the swallowing of liquid and different food consistencies and quantities. Quality of evidence: Low ⊕⊕ Strength of recommendation: Weak for intervention ↑?
Dysphagia Treatment	
a. Dietary Interventions	
1. In patients with post-stroke dysphagia does texture diet modification compared to no texture	Recommendations 5: In patients with post-stroke dysphagia, we suggest that texture modified diets and/or

diet modification improve functional outcome and/or survival, reduce aspiration risk, reduce length of hospital stay, reduce adverse events and complications, improve swallowing status/ ability, have an effect on nutritional status, and have an effect on quality of life? 2. In patients with post-stroke dysphagia, does fluid thickening compared to no fluid thickening, improve functional outcome and/or survival, reduce aspiration risk, reduce length of hospital stay, reduce adverse events and complications, improve swallowing status/ ability, have an effect on nutritional status, and have an effect on quality of life?	thickened liquids may be used to reduce the risk of pneumonia. Quality of evidence: Low ⊕⊕ Strength of recommendation: Weak for intervention ↑? Recommendation 6: In patients with post-stroke dysphagia we recommend that texture modified diets and/or thickened liquids are prescribed only based on an appropriate assessment of swallowing. Quality of evidence: Low ⊕⊕ Strength of recommendation: Strong for intervention ↑↑ Recommendation 7: In stroke patients put on texture modified diet and/or thickened liquids we recommend to monitor fluid balance and nutritional intake. Quality of evidence: Moderate ⊕⊕⊕ Strength of recommendation: Strong for intervention ↑↑
b. Behavioural interventions	
1. In patients with post-stroke dysphagia do behavioural swallowing exercises compared to no treatment improve functional outcome and/or survival, reduce aspiration risk, reduce length of hospital stay, reduce adverse events and complications, improve swallowing status/ ability, have an effect on nutritional status, and have an effect on quality of life?	Recommendation 8: In patients with post-stroke dysphagia, we suggest behavioural swallowing exercises to rehabilitate swallowing function. Quality of evidence: Moderate ⊕⊕⊕ Strength of recommendation: Weak for intervention ↑? Recommendation 9: In patients with post-stroke dysphagia, we suggest that behavioural interventions should not be limited to one specific manoeuvre or training, but the treatment should be tailored to the specific swallowing impairment of the individual patient based on a careful assessment of dysphagia. Quality of evidence: Moderate ⊕⊕⊕ Strength of recommendation: Weak for intervention ↑? Recommendation 10: In patients with post-stroke dysphagia, we suggest that acupuncture may be used to rehabilitate swallowing function. Quality of evidence: Moderate ⊕⊕⊕ Strength of recommendation: Weak for intervention ↑?
c. Nutritional Interventions	
1. In patients with post-stroke dysphagia does early initiation of oral nutritional therapy compared to late initiation of nutritional therapy improve functional outcome and/or survival, reduce	Recommendation 11: In unselected stroke patients, we suggest to avoid routine use of oral nutritional supplementation. Quality of evidence: Moderate ⊕⊕⊕

aspiration risk, reduce length of hospital stay, reduce adverse events and complications, improve swallowing status/function, have an effect on nutritional status, and have an effect on quality of life? 2. In patients with post-stroke dysphagia does early enteral or parenteral feeding compared to late or restrictive enteral or parenteral feeding improve functional outcome and/or survival, reduce aspiration risk, reduce length of hospital stay, reduce adverse events and complications, improve swallowing status/ability, have an effect on nutritional status, and have an effect on quality of life?	Strength of recommendation: Weak against intervention ↓? Recommendation 12: In stroke patients who tolerate an oral diet and present with a risk of malnutrition or with manifest malnutrition, we suggest to consider the use of oral nutritional supplementation. Quality of evidence: Low ⨁⨁ Strength of recommendation: Weak for intervention ↑? Recommendation 13: In patients with post-stroke dysphagia and insufficient oral intake we suggest an early enteral nutrition via a nasogastric tube. Quality of evidence: Moderate ⨁⨁⨁ Strength of recommendation: Weak for intervention ↑?
d. Interventions to improve oral health	
1. In patients with post-stroke dysphagia does specific oral health care compared to standard care improve functional outcome and/or survival, reduce aspiration risk, reduce length of hospital stay, reduce adverse events and complications, improve swallowing status/ ability, have an effect on nutritional status, and have an effect on quality of life?	Recommendation 14: In stroke patients we suggest to implement oral health care interventions to reduce the risk of pneumonia. Quality of evidence: Low ⨁⨁ Strength of recommendation: Weak for intervention ↑?
e. Pharmacological treatment	
1. In patients with post-stroke dysphagia, does pharmacological treatment compared to no treatment improve functional outcome and/or survival, reduce aspiration risk, reduce length of hospital stay, reduce adverse events and complications, improve swallowing status/ ability, have an effect on nutritional status, and have an effect on quality of life?	Recommendation 15: We recommend that due to the limited evidence available with regards to clinical endpoints, pharmacological treatment of post-stroke dysphagia should be preferably used within clinical trial settings. Quality of evidence: Low ⨁⨁ Strength of recommendation: Strong for intervention ↑↑ Recommendation 16: We recommend that preventive antimicrobial treatment is not used in stroke patients. Quality of evidence: High ⨁⨁⨁⨁ Strength of recommendation: Strong against intervention ↓↓ Recommendation 17: In stroke patients with post-stroke dysphagia and an impaired swallow response, we suggest to consider TRPV1 agonists and dopaminergic agents to improve swallowing safety. Quality of evidence: Low ⨁⨁ Strength of recommendation: Weak for intervention ↑?

	Recommendation 18: In stroke patients fed via a nasogastric tube, we suggest to use metoclopramide to promote gastric emptying and reduce the risk of esophago-pharyngeal regurgitation with subsequent aspiration. Quality of evidence: Low ⨁⨁ Strength of recommendation: Weak for intervention ↑?
f. Neurostimulation treatment	
1. In patients with post-stroke dysphagia, do neurostimulation techniques compared to no treatment, improve functional outcome and/or survival, reduce aspiration risk, reduce length of hospital stay, reduce adverse events and complications, improve swallowing status/ ability, have an effect on nutritional status, and have an effect on quality of life? 2. In patients with post-stroke dysphagia, do neurostimulation techniques compared to behavioural treatments improve functional outcome and/or survival, reduce aspiration risk, reduce length of hospital stay, reduce adverse events and complications, improve swallowing status/ ability, have an effect on nutritional status, and have an effect on quality of life?	Recommendation 19: In patients with post-stroke dysphagia, we recommend that treatment with neurostimulation techniques should preferably be conducted within a clinical trial setting. Quality of evidence: Low ⨁⨁ Strength of recommendation: Strong for intervention ↑↑ Recommendation 20: In patients with post-stroke dysphagia, we suggest treatment with rTMS, TES, tDCS and PES as adjunct to conventional dysphagia treatments. Quality of evidence: Moderate ⨁⨁⨁ Strength of recommendation: Weak for intervention ↑? Recommendation 21: In tracheotomized stroke patients with severe dysphagia, we suggest treatment with pharyngeal electrical stimulation to accelerate decannulation. Quality of evidence: High ⨁⨁⨁⨁ Strength of recommendation: Weak for intervention ↑?

Supplement 2: Search Strategies

Epidemiology

1. ((stroke) OR (transient ischemic attack*) OR (TIA) OR (mild stroke) OR (minimal stroke) OR (brain hypoxia) OR (brain infarct*) OR (brain haemorrhage) OR (brain ischemia) OR (brain isch?emi*) OR (basal ganglia cerebrovascular disease) OR (cardioembolic stroke) OR (cerebral embolism) OR (cerebral haemorrhage) OR (cerebral infarct*) OR (cerebrovascular accident*) OR (CVA) OR (cerebrovascular apoplexy) OR (cerebrovascular infarct*) OR (cerebrovascular embolism) OR (cerebrovascular disorder) OR (acute isch?emi* stroke) OR (Ischemic stroke) OR (Ischemic apoplexy) OR (intracranial embolism) OR (Intracranial thrombosis) OR (hemiparesis) OR (hemiplegia)).tw,ti,ab.
2. ((anterior cerebral artery infarction) OR (middle cerebral artery infarction) OR (posterior cerebral artery infarction) OR (lacunar stroke) OR (wind stroke) OR (anterior circulation occlusion) OR (Post-stroke) OR (Apoplexy)).tw,ti,ab.
3. #1 OR #2
4. ((dysphagia) OR (deglutition) OR Swallowing OR (swallowing disorders) OR (deglutition disorders) OR (impaired swallowing) OR (pneumonia OR aspiration) OR (respiratory aspiration) OR (inhalation) OR (cough) OR (gastric motility) OR (odynophagia)).tw,ti,ab.
5. oropharynx$ or trachea$ or lung$ or pulmon$ adj5 aspirat$
6. #4 OR #5
7. (Outcomes OR complication OR (quality of life) OR hospitalization OR (Length of stay) OR mortality OR morbidity OR (adverse events) OR (adverse effects) OR (nutritional status) OR nutrition OR survival)
8. #3 AND #6 AND #7

Dysphagia Screening

1. ((stroke) OR (transient ischemic attack*) OR (TIA) OR (mild stroke) OR (minimal stroke) OR (brain hypoxia) OR (brain infarct*) OR (brain haemorrhage) OR (brain ischemia) OR (brain isch?emi*) OR (basal ganglia cerebrovascular disease) OR (cardioembolic stroke) OR (cerebral embolism) OR (cerebral haemorrhage) OR (cerebral infarct*) OR (cerebrovascular accident*) OR (CVA) OR (cerebrovascular apoplexy) OR (cerebrovascular infarct*) OR (cerebrovascular embolism) OR (cerebrovascular disorder) OR (acute isch?emi* stroke) OR (Ischemic stroke) OR (Ischemic apoplexy) OR (intracranial embolism) OR (Intracranial thrombosis) OR (hemiparesis) OR (hemiplegia)).tw,ti,ab.
2. ((anterior cerebral artery infarction) OR (middle cerebral artery infarction) OR (posterior cerebral artery infarction) OR (lacunar stroke) OR (wind stroke) OR (anterior circulation occlusion) OR (Post-stroke) OR (Apoplexy)).tw,ti,ab.
3. #1 OR #2
4. ((dysphagia) OR (deglutition) OR Swallowing OR (swallowing disorders) OR (deglutition disorders) OR (impaired swallowing) OR (pneumonia OR aspiration) OR (respiratory aspiration) OR (inhalation) OR (cough) OR (gastric motility) OR (odynophagia)).tw,ti,ab.
5. oropharynx$ or trachea$ or lung$ or pulmon$ adj5 aspirat$
6. #4 OR #5
7. (Screening OR Diagnosis OR Sensitivity OR Specificity OR Questionnaire OR test OR Evaluation OR tool OR appraisal OR (predictive value)).tw,ti,ab.
8. #3 AND #6 AND #7

Dysphagia Assessment

1. ((stroke) OR (transient ischemic attack*) OR (TIA) OR (mild stroke) OR (minimal stroke) OR (brain hypoxia) OR (brain infarct*) OR (brain haemorrhage) OR (brain ischemia) OR (brain isch?emi*) OR (basal ganglia cerebrovascular disease) OR (cardioembolic stroke) OR (cerebral embolism) OR (cerebral haemorrhage) OR (cerebral infarct*) OR (cerebrovascular accident*) OR (CVA) OR (cerebrovascular apoplexy) OR (cerebrovascular infarct*) OR (cerebrovascular embolism) OR (cerebrovascular disorder) OR (acute isch?emi* stroke) OR (Ischemic stroke) OR (Ischemic apoplexy) OR (intracranial embolism) OR (Intracranial thrombosis) OR (hemiparesis) OR (hemiplegia)).tw,ti,ab.
2. ((anterior cerebral artery infarction) OR (middle cerebral artery infarction) OR (posterior cerebral artery infarction) OR (lacunar stroke) OR (wind stroke) OR (anterior circulation occlusion) OR (Post-stroke) OR (Apoplexy)).tw,ti,ab.
3. #1 OR #2
4. ((dysphagia) OR (deglutition) OR Swallowing OR (swallowing disorders) OR (deglutition disorders) OR (impaired swallowing) OR (pneumonia OR aspiration) OR (respiratory aspiration) OR (inhalation) OR (cough) OR (gastric motility) OR (odynophagia)).tw,ti,ab.
5. oropharynx$ or trachea$ or lung$ or pulmon$ adj5 aspirat$
6. #4 OR #5
7. ((clinical assessment) OR (medical history taking) OR (symptoms assessment) OR (physical examination) OR (clinical swallowing Evaluation) OR (CSE) OR (Questionnaire) OR (auscultation methods) OR (respiratory sounds) OR (diagnostic self-evaluation) OR (Clinical medicine) OR (mass screening) OR (Bedside screening tests) OR (Toronto Bedside Swallowing Screening Test) OR (Nursing Bedside Swallowing Screen tool) OR (NBSS tool) OR (TOR-BSST) OR (TOR-BSST) OR (fluoroscopy) OR (videofluoroscopy) OR (VFS) OR (VFSS) OR (Videofluoroscopic swallow study) OR (instrumental assessment) OR (instrument assessment) OR (fibreoptic endoscopic evaluation) OR (Fiberoptic endoscopic evaluation of swallowing) OR (FEES) OR (Swallowing accelerometry) OR (TOR-BSST) OR (RADAVE) OR (Watian Swallowing Test) OR (Swallowing Functional Assessment) OR (Swallowing Disorder Integral) OR (Gugging Swallowing Screen) OR (Swallowing screening) OR (Royal Brisbane and Women's Hospital dysphagia screening tool) OR (RBWH) OR (I-RBWH) OR (Mann assessment of swallowing ability) OR (MASA) OR (Acoustic analysis) OR (Acoustic*) OR (Burks Dysphagia Screening Test) OR (BDST) OR (modified barium swallow) OR (MBS) OR (flexible endoscopic evaluation of swallowing) OR (FEES)).tw,ti,ab.
8. ((electromyography) OR (Surface electromyography) OR (EMG) OR (sEMG) OR (Neuromuscular Disease Swallowing Status Scale) OR (NdSSS) OR (Sydney Swallow Questionnaire) OR (SSQ) OR (spirometry) OR (Lung function test)).tw,ti,ab.
9. (Dysphagia assessment) adj5 instrument
10. #7 OR #8 OR #9
11. #3 AND #6 AND #12

Dysphagia Treatment

1. ((stroke) OR (transient ischemic attack*) OR (TIA) OR (mild stroke) OR (minimal stroke) OR (brain hypoxia) OR (brain infarct*) OR (brain haemorrhage) OR (brain ischemia) OR (brain isch?emi*) OR (basal ganglia cerebrovascular disease) OR (cardioembolic stroke) OR (cerebral embolism) OR (cerebral haemorrhage) OR (cerebral infarct*) OR (cerebrovascular accident*) OR (CVA) OR (cerebrovascular apoplexy) OR (cerebrovascular infarct*) OR (cerebrovascular embolism) OR (cerebrovascular disorder) OR (acute isch?emi* stroke) OR (Ischemic stroke) OR (Ischemic apoplexy) OR (intracranial embolism) OR (Intracranial thrombosis) OR (hemiparesis) OR (hemiplegia)).tw,ti,ab.
2. ((anterior cerebral artery infarction) OR (middle cerebral artery infarction) OR (posterior cerebral artery infarction) OR (lacunar stroke) OR (wind stroke) OR (anterior circulation occlusion) OR (Post-stroke) OR (Apoplexy)).tw,ti,ab.
3. #1 OR #2
4. ((dysphagia) OR (deglutition) OR Swallowing OR (swallowing disorders) OR (deglutition disorders) OR (impaired swallowing) OR (pneumonia OR aspiration) OR (respiratory aspiration) OR (inhalation) OR (cough) OR (gastric motility) OR (odynophagia)).tw,ti,ab.
5. oropharynx$ or trachea$ or lung$ or pulmon$ adj5 aspirat$
6. #4 OR #5
7. (Stimulation OR Electrical OR Vitalstim OR vocastim OR stimulation OR neurostimulation OR (neuromuscular stimulation) OR (Electrical stimulation) OR (Neuromuscular electrical stimulation) OR (NMES) OR (Pharyngeal electrical stimulation) OR (PES) OR (Physical stimulation) OR (Transcranial Direct Current Stimulation) OR (TDCS) OR (transcranial magnetic stimulation) OR (brain stimulation) OR (cortical stimulation) OR (non-invasive brain stimulation) OR (repetitive transcranial magnetic stimulation) OR RTMS OR (Evoked potential) OR (motor cortex stimulation) OR (cortex stimulation) OR (alternate therapy) OR (Physical stimulation) OR (thermal OR tactile)).tw,ti,ab.
8. ((acupuncture) OR (Acupressure) OR (needle therapy) OR (acupuncture therapy) OR (acupuncture treatment) OR (acupuncture methods)).tw,ti,ab.
9. ((Behaviour treatment) OR (Swallowing exercises) OR (Behavior change techniques) OR rehabilitation OR exercise OR behavio* OR (swallowing training) OR (swallowing exercise*) OR (Neuromuscular exercises) OR (Myofunctional Therapy) OR intervention OR exercise OR (therapeutic exercise*) OR (Tongue resistance Effortful swallow) OR gargling OR (Jaw exercise) OR (Therabite stretch) OR (terabite swallow) OR (Effortful swallow) OR (Mendelsohn Masako) OR Positioning OR posture).tw,ti,ab.
10. ((Oral nutrition) OR diet OR nutrition OR (fortified food) OR (diet therapy) OR (diet modification) OR (texture modified) OR (pureed diet) OR (thickened drinks) OR dysphagia diet OR consistency OR mashed OR chopped OR liquid OR fork OR (Liquidized diet) OR (modified diet) OR (Nutritional supplement) OR (oral supplement) OR (nutrition support) OR (artificial feeding) OR (Enteral nutrition) OR (Enteral feeding) OR (Tube feeding) OR (Gastric tube feeding) OR (Nasoenteric feeding) OR (Nasogastric feeding) OR (Nasojejunal feeding) OR (Nasoduodenal feeding) OR (Artificial feeding) OR (Gastrostomy) OR (Percutaneous endoscopic gastrostomy) OR (sip feeding) OR (feeding route) OR (nasogastric tube) OR Nasogastric OR (nasojejunal tube) OR NJT OR (gastrointestinal intubation) OR (oral intake)

OR (tube feeding) OR sham OR (sham feeding) OR (sham stimulation) OR (restrictive enteral) OR (late enteral)).tw,ti,ab.

11. (Liquids) OR (thin liquid) OR (thickened liquid) OR (thickened drinks) OR (viscosity) OR (pureed diet) OR (puree consistency) OR (mashed) OR (chopped) OR (soft solid food) OR (solid diet) OR (dysphagia diet) OR (consistency) OR (varibar) OR (Minimal Eating Observation Form) OR (Minimal Eating Form) OR (diet modification) OR (non-thickened liquid) OR (Texture modified diet) OR (texture diet) OR (dietary protein) OR (oral nutrition) OR (solid regular-texture diet)).tw,ti,ab.
12. (Medication OR Therapy OR therapeutics OR Treatment OR Drugs OR (pharmacological agents) OR nifedipine OR (Calcium antagonist) OR (Calcium channel blocker) OR (antibacterial oral gel) OR (drug treatment) OR (angiotensin converting enzyme inhibitor) OR (angiotensin converting enzyme) OR (Levodopa)).tw,ti,ab.
13. ((Malnutrition) OR (under nutrition) OR (poor nutrition) OR (Nutrition Disorders) OR (Nutritional Deficiency) OR (Subnutrition OR Sub-nutrition) OR (Nutritional status) OR (health status) OR nutrition).tw,ti,ab.
14. ((Nutrition therapy) OR (Diet therapy) OR (treatment OR management OR intervention OR supplementation) OR (feeding or nutrition) OR (nutritional supplementation) OR (swallowing therapy) OR (tube feeding) OR fluid OR (fluid supplementation) OR (sip feeding) OR (feeding route) OR timing OR diet OR hydration).tw,ti,ab.
15. ((Parenteral nutrition) OR (Parenteral feeding) OR (parenteral feed) OR (parenteral food) OR (parenteral nutrition) OR (total parenteral nutrition) OR TPN OR (total nutrient admixture) OR (partial parenteral nutrition) OR (peripheral parenteral nutrition) OR (central venous nutrition) OR (intravenous nutrition) OR (IV nutrition) OR (subcutaneous nutrition) OR (SC nutrition) OR (SC feed)).tw,ti,ab.
16. (Consistency OR (Liquids) OR (thin liquid) OR (thickened liquid) OR (thickened drinks) OR (viscosity) OR (pureed diet) OR (puree consistency) OR (mashed) OR (chopped) OR (soft solid food) OR (solid diet) OR (dysphagia diet) OR (consistency) OR (varibar) OR (E-Z-EM's Varibar) OR (Minimal Eating Observation Form) OR (Minimal Eating Form) OR (MEOF) OR (Oral nutrition) OR (texture modified diet) OR (diet modification)).tw,ti,ab.
17. ((Oral health) OR (oral mucositis) OR (oral candidiasis) OR (dental health) OR (oral dental care) OR (dental caries) OR (oral care) OR (gum)).tw,ti,ab.
18. #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17
19. #3 AND #6 AND #18

Supplement 3: PRISMA Diagrams

Figure 1: Epidemiology

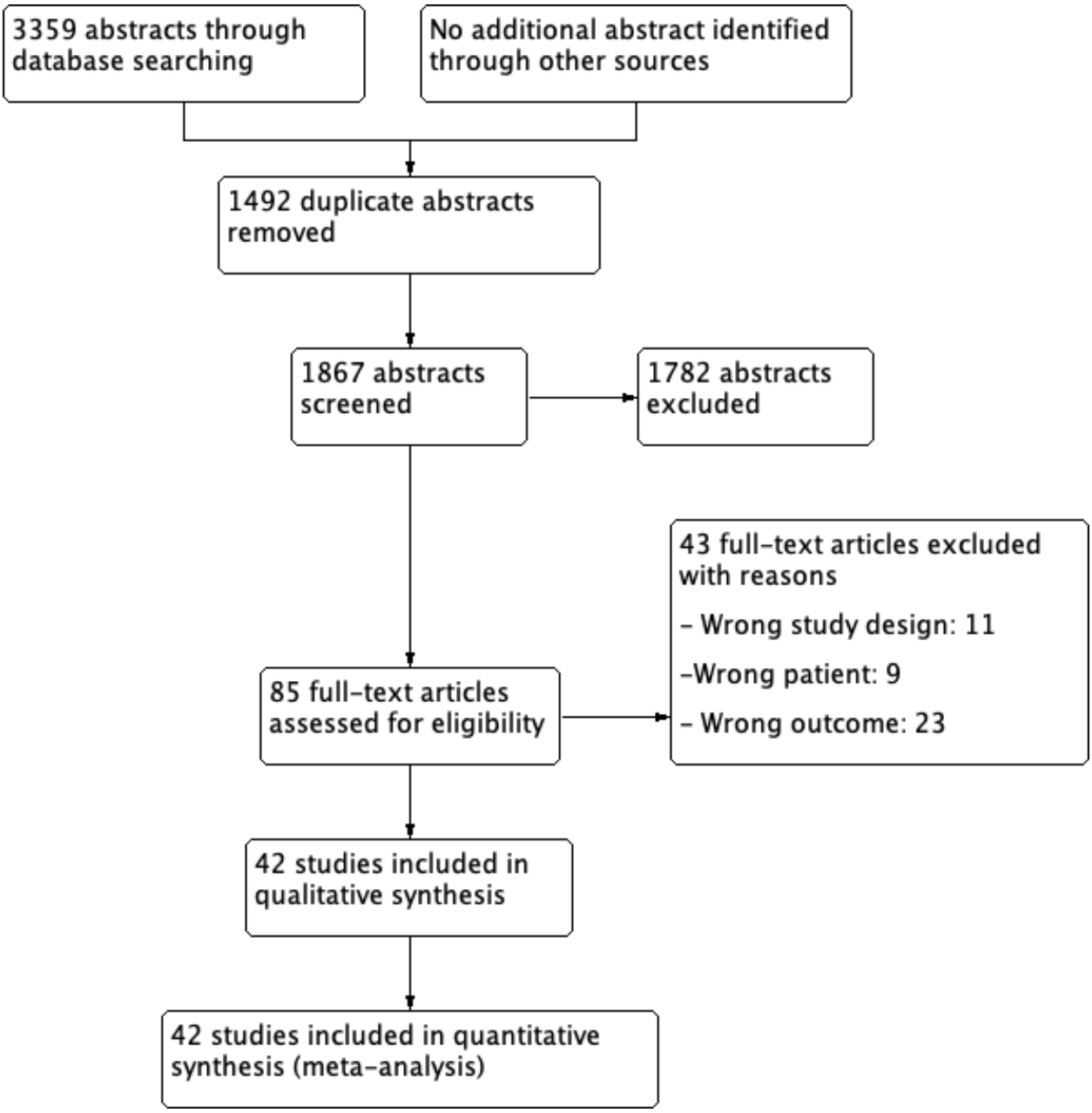


Figure 2: Screening

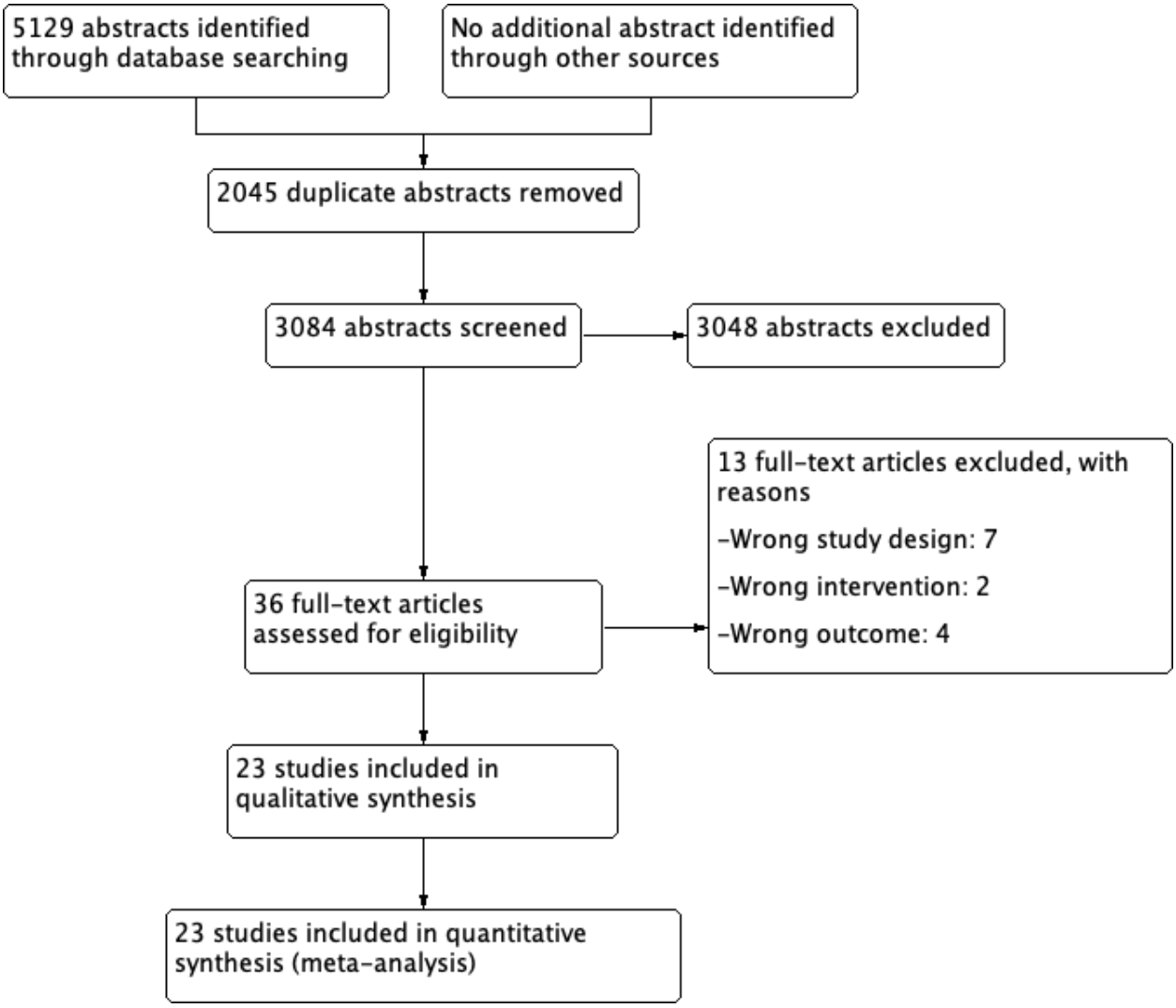


Figure 3: Assessment

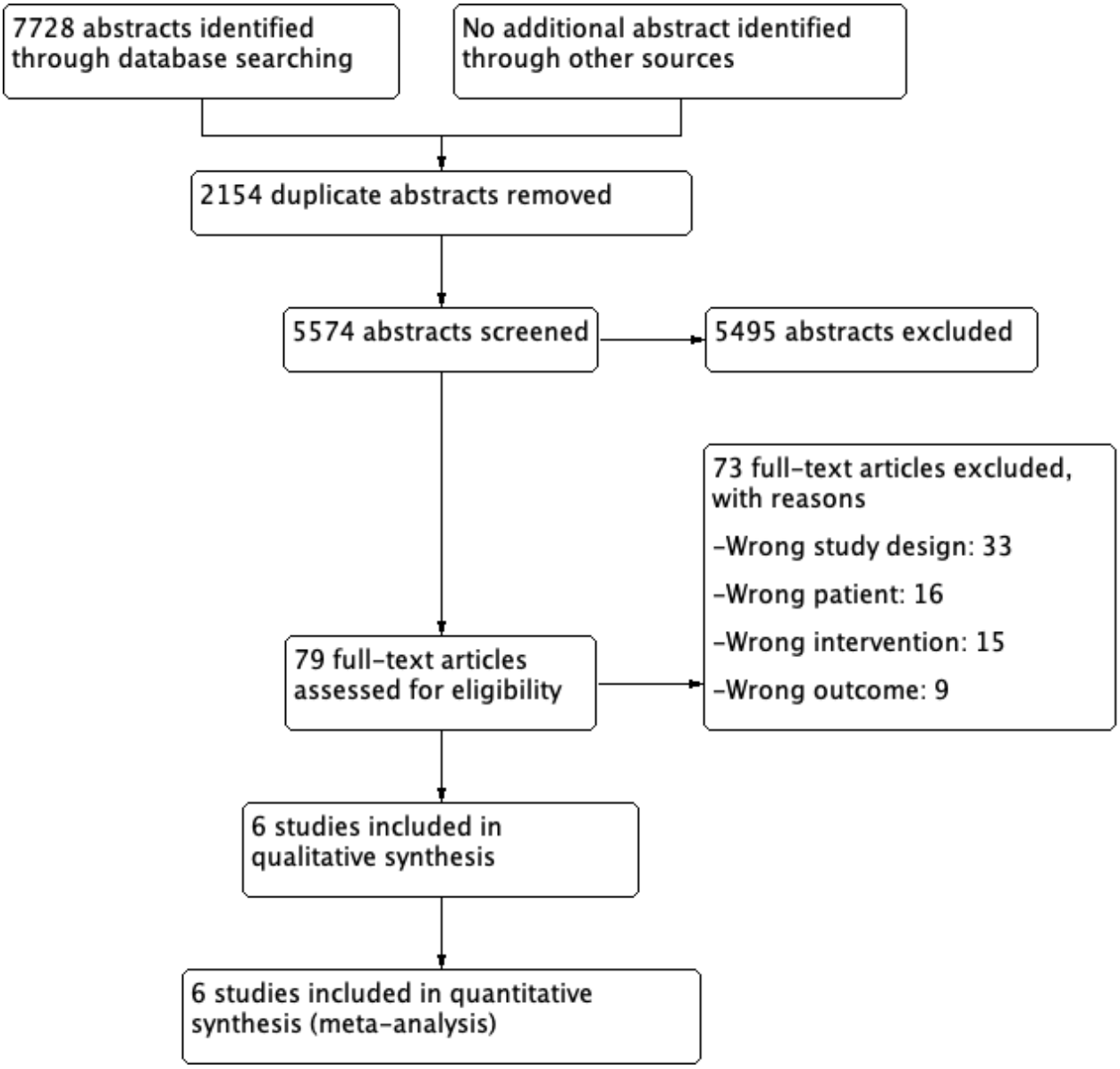
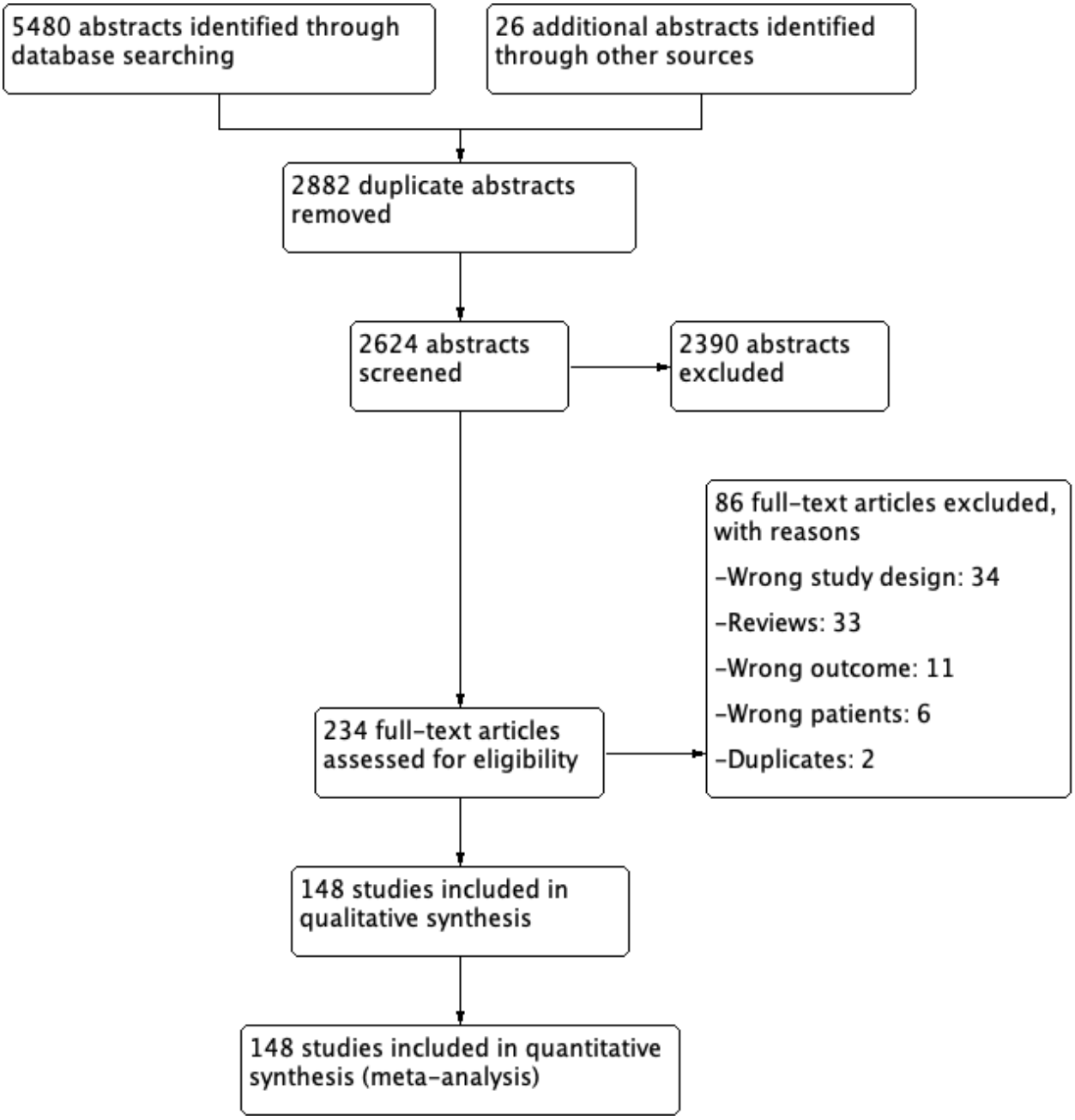


Figure 4: Treatments



Supplement 4: Meta-Analyses

Epidemiology

PICO 1

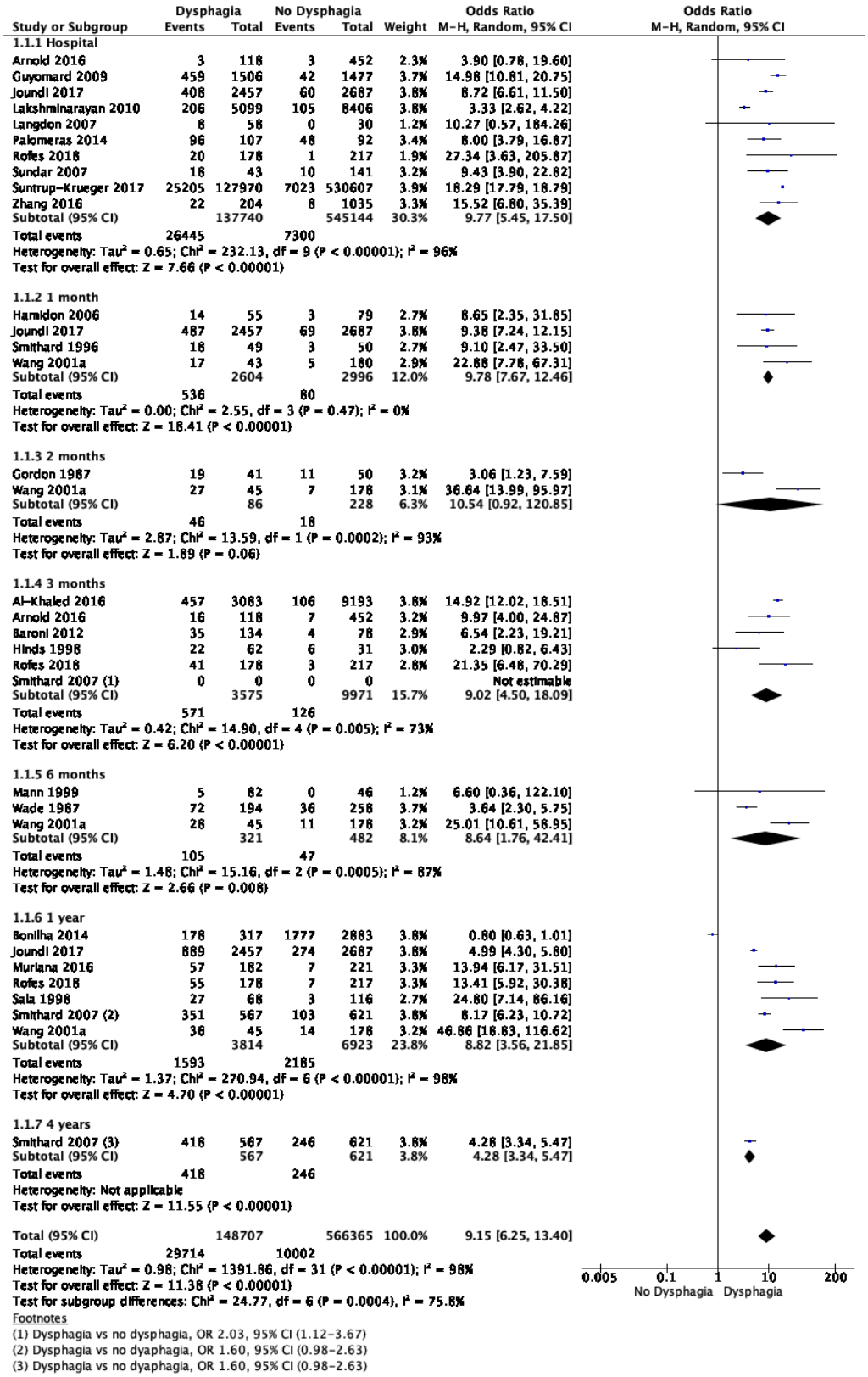
Table 1: Effect of dysphagia compared to no dysphagia on mortality, pneumonia, aspiration risk, and length of stay in hospital in patients with stroke

Outcome	Incidence (%)/ Mean±SD		n (N)	OR [95% CI]/ MD [95% CI]	I^2	P value
	Dysphagia	No dysphagia				
Mortality						
• **Mortality, hospital**	19%	1%	10(682884)	9.77 [5.45, 17.50]	96%	< 0.00001
• **Mortality, 1 month**	21%	3%	4(5600)	9.78 [7.67, 12.46]	0%	< 0.00001
• **Mortality, 2 months**	53%	8%	2(314)	10.54 [0.92, 120.85]	93%	0.06
• **Mortality, 3 months**	16%	1%	5(13546)	9.02 [4.50, 18.09]	73%	< 0.00001
• **Mortality, 6 months**	33%	10%	3(803)	8.64 [1.76, 42.41]	87%	0.008
• **Mortality, 1 year**	42%	32%	7(10737)	8.82 [3.56, 21.85]	98%	< 0.00001
• **Mortality, 4 years**	74%	40%	1(1188)	4.28 [3.34, 5.47]	NA	< 0.00001
Pneumonia	22%	3%	31(767179)	7.45 [6.01, 9.24]	94%	< 0.00001
Tubing						
• **Nasogastric tube**	41%	1%	2(8171)	93.74 [24.33, 361.14]	35%	< 0.00001
• **Percutaneous feeding tube**	9%	0.1%	4(8446)	71.60 [34.38, 149.11]	0%	< 0.00001
mRS						
• **mRS 0, 1**	6%	30%	2(5582)	0.20 [0.11, 0.35]	83%	< 0.00001
• **mRS ≥2**	76%	55%	3(17858)	2.34 [1.24, 4.40]	98%	0.08
• **mRS 4,5**	52%	18%	1(5012)	5.03 [4.43, 5.72]	NA	< 0.00001
LOS						
• **LOS, days**	12.1±9.7	8.4±6.2	14(697614)	4.72 [3.53, 5.91]	99%	< 0.00001
• **LOS, stroke unit**	4.4±3.0	2.7±2.4	1(570)	1.70 [1.12, 2.28]	NAs	< 0.00001
Swallowing						
• **Mann Score**	135.3	193.6	2(130)	-57.35 [-77.04, -37.67]	97%	< 0.0001
• **FOIS**	3.2	6.8	2(172)	-3.63 [-4.23, -3.03]	97%	< 0.0001
Discharge status						
• **Discharged home**	17%	67%	8(678519)	0.17 [0.09, 0.35]	100%	< 0.00001
• **Discharged to**	49%	26%	7(665094)	3.90 [2.93, 5.21]	81%	< 0.00001

Institution/Palliative						
• **Discharged to long term care**	15%	5%	2(663721)	1.95 [0.71, 5.32]	100%	0.19
• **Readmission, 1 year**	42%	54%	1(395)	0.62 [0.42, 0.93]	NA	0.02

CI: Confidence intervals; FOIS: Functional oral intake scale; I^2: Heterogeneity; LOS, Length of stay in hospital; MD: Mean difference; n: Number of studies; N: Number of patients; NIHSS: National Institute of Health Stroke Scale; p: Statistical significance value; OR: Odds Ratio; SD: Standard deviation

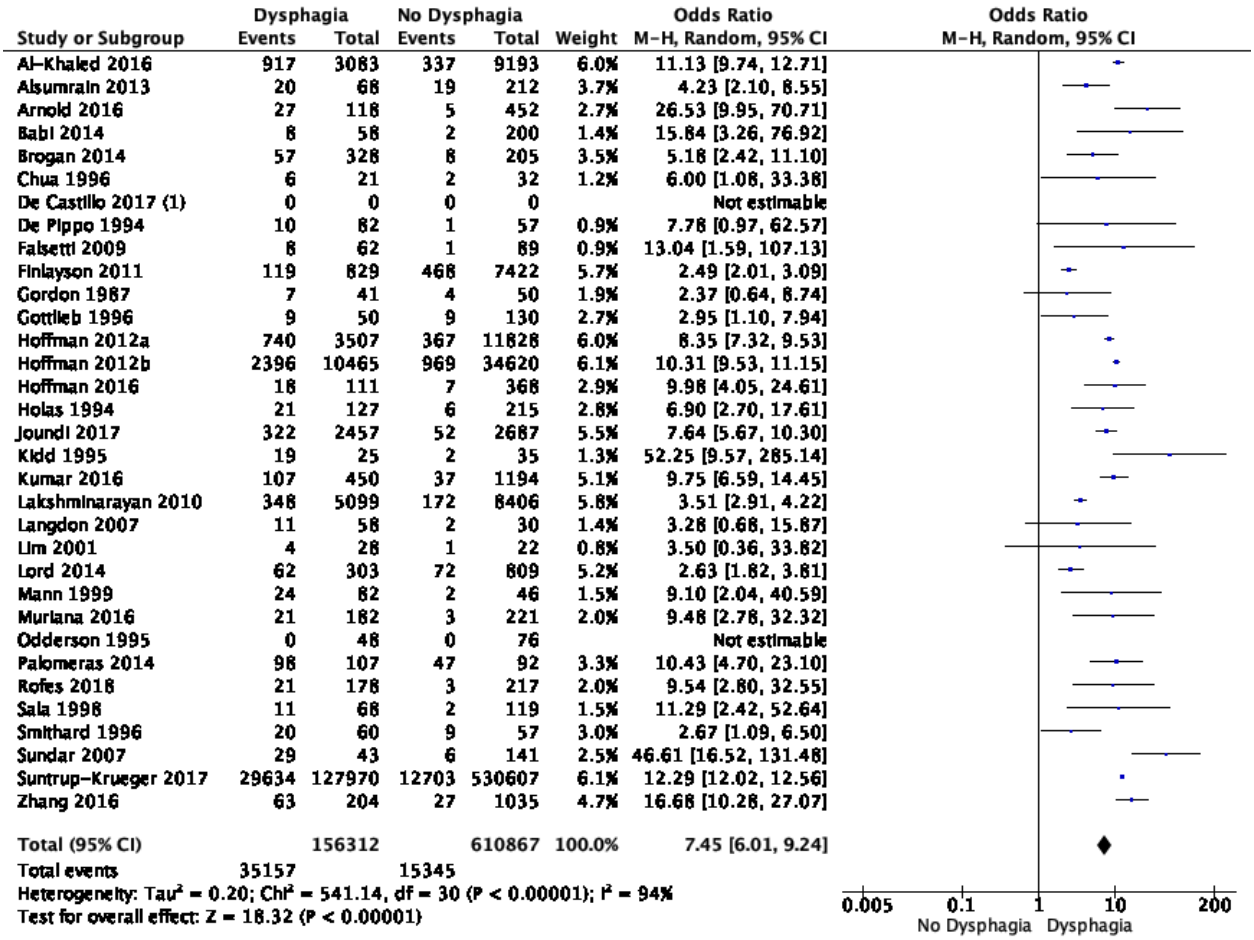
Figure: Effect of dysphagia compared to no dysphagia on mortality in patients with stroke



Footnotes

(1) Dysphagia vs no dysphagia, OR 2.03, 95% CI (1.12–3.67)
(2) Dysphagia vs no dyaphagia, OR 1.60, 95% CI (0.98–2.63)
(3) Dysphagia vs no dyaphagia, OR 1.60, 95% CI (0.98–2.63)

Figure: Effect of dysphagia compared to no dysphagia on pneumonia in patients with stroke



Footnotes

(1) Multivariate logistic regression analysis: Association of pneumonia with dysphagia OR = 5.20

Figure: Effect of dysphagia compared to no dysphagia on tubing in patients with stroke

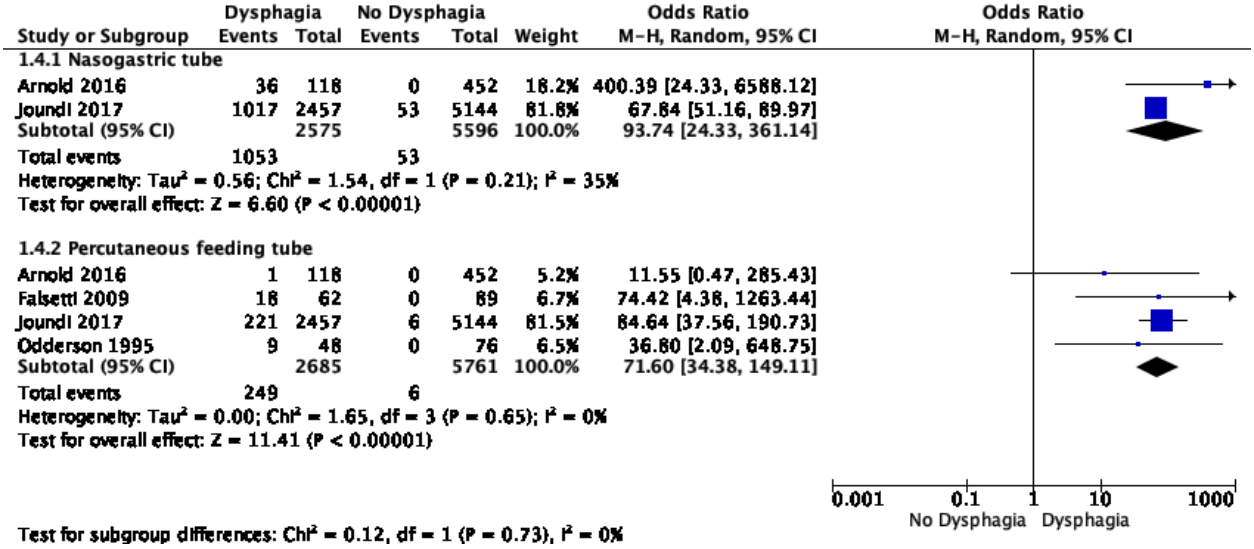
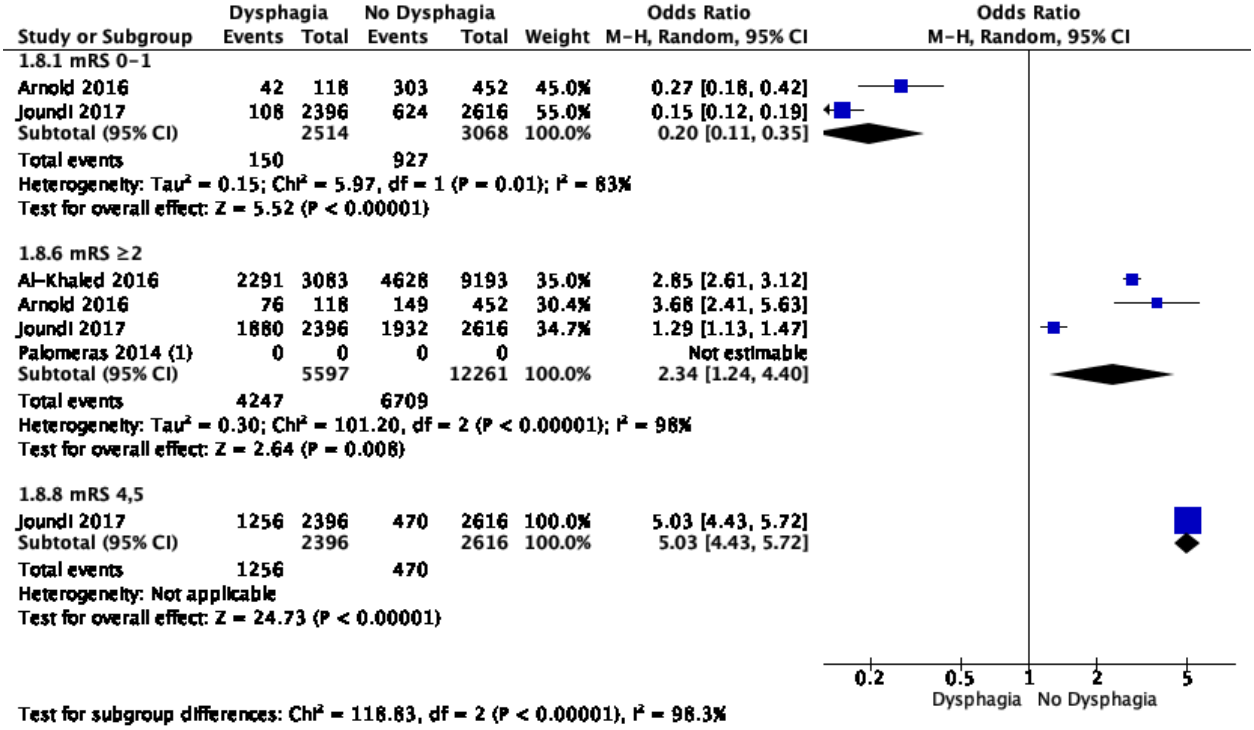


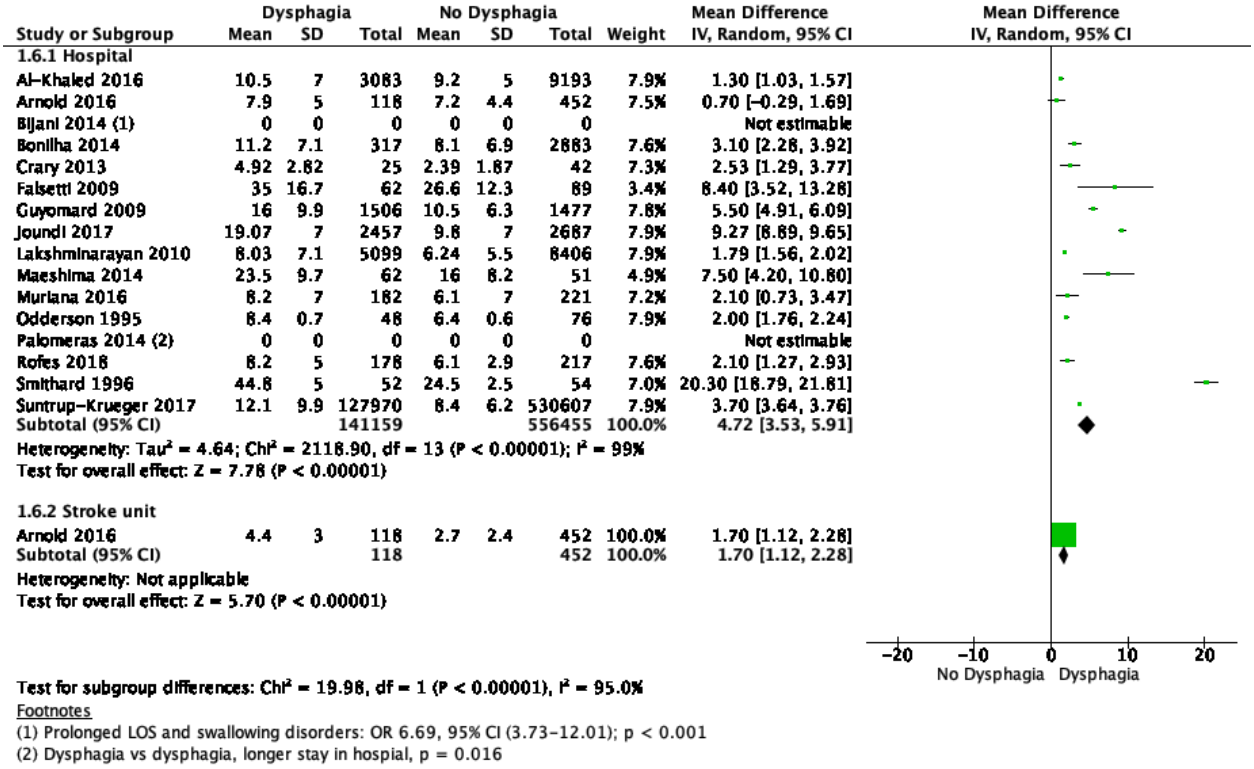
Figure: Effect of dysphagia compared to no dysphagia on mRS in patients with stroke



Footnotes

(1) Dysphagia vs dysphagia, p < 0.001

Figure: Effect of dysphagia compared to no dysphagia on length of stay in hospital or stroke unit in patients with stroke



Footnotes

(1) Prolonged LOS and swallowing disorders: OR 6.69, 95% CI (3.73–12.01); p < 0.001

(2) Dysphagia vs dysphagia, longer stay in hospial, p = 0.016

Figure: Effect of dysphagia compared to no dysphagia on swallowing functions in patients with stroke

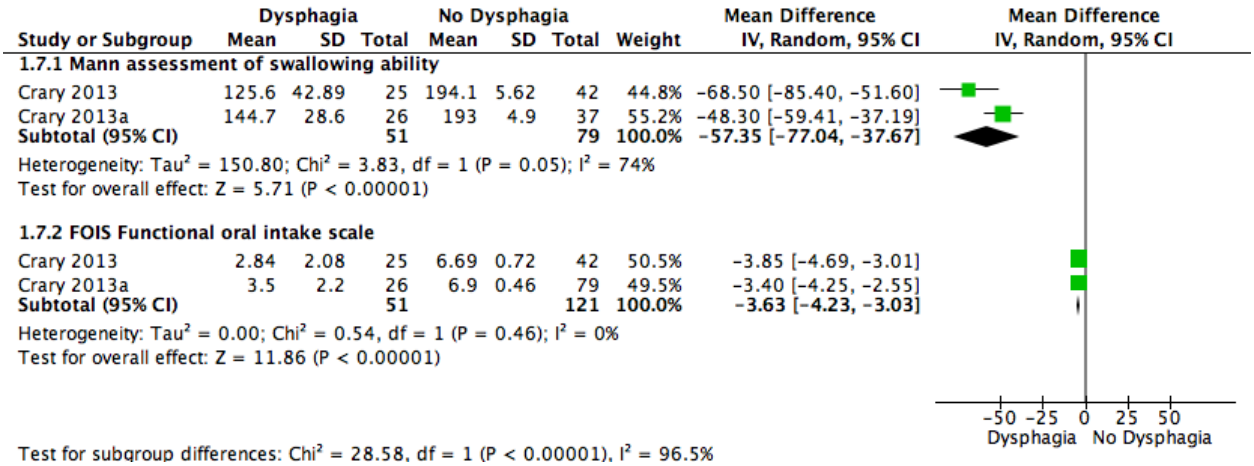
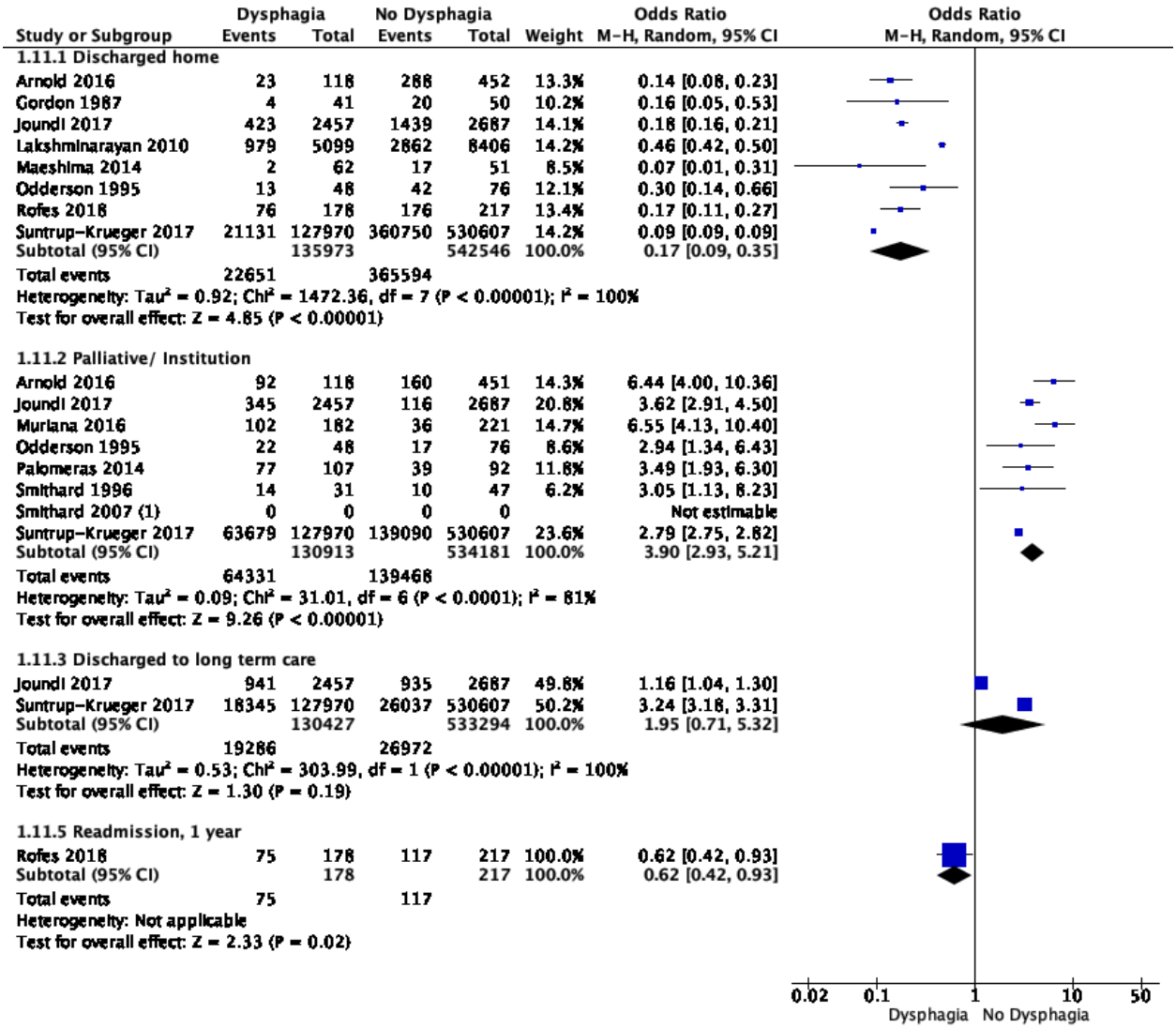


Figure: Effect of dysphagia compared to no dysphagia on discharge status in patients with stroke



Footnotes

(1) Dysphagia vs no dysphagia, OR 1.73, 95% CI (1.02–2.95)

Table 2: Effect of dysphagia compared to no dysphagia on adverse effects and quality of life in patients with stroke

Outcome	Incidence (%)/ Mean± SD		n (N)	OR [95% CI]/ MD [95% CI]	I^2	P value
	Dysphagia	No dysphagia				
Neurological worsening	25%	7.0%	2(5774)	4.81 [2.94, 7.87]	51%	<0.00001
Seizure	2.9%	0.9%	1(5144)	3.45 [2.15, 5.53]	NA	<0.00001
Depression	3.3%	1.2%	1(5144)	2.86 [1.90, 4.33]	NA	<0.00001
Deep vein thrombosis	1.5%	0.4%	1(5144)	3.62 [1.84, 7.12]	NA	0.0002
Myocardial infarction	2.6%	1.0%	1(5144)	2.54 [1.62, 3.97]	NA	<0.00001
Cardiac arrest	4.4%	0.7%	1(5144)	6.75 [4.09, 11.16]	NA	<0.00001
Decubitus ulcer	1.9%	0.2%	1(5144)	8.53 [3.63, 20.00]	NA	<0.00001
UTI	6.7%	0.9%	1(395)	7.77 [1.72, 35.20]	NA	0.008
Gastrointestinal bleeding	2.4%	0.6%	1(5144)	4.46 [2.53, 7.87]	NA	<0.00001
Ambulation, 2 days	24%	38%	1(13505)	0.53 [0.49, 0.57]	NA	< 0.00001
Ambulation, discharge	27%	46%	1(13505)	0.43 [0.40, 0.46]	NA	< 0.00001
Charlson comorbidity score	3.5±1.7	3.3±1.8	1(3200)	0.20 [0.00, 0.40]	NA	0.05
Functional independence measure	41.1±18.6	71.3±18.6	2(264)	-37.01 [-75.23, 1.21]	99%	0.06
Functional independence measure-motor	26.8±11.9	40.1±26.8	1(290)	-13.30 [-17.75, -8.85]	NA	<0.00001
Functional independence measure-cognitive	15±7.4	22.7±7.9	1(290)	-7.70 [-9.59, -5.81]	NA	<0.00001

CI: Confidence intervals; I^2: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; p: Statistical significance value; OR: Odds Ratio; SD: Standard deviation; UTI: Urinary tract infections

Figure: Effect of dysphagia compared to no dysphagia on adverse events in patients with stroke

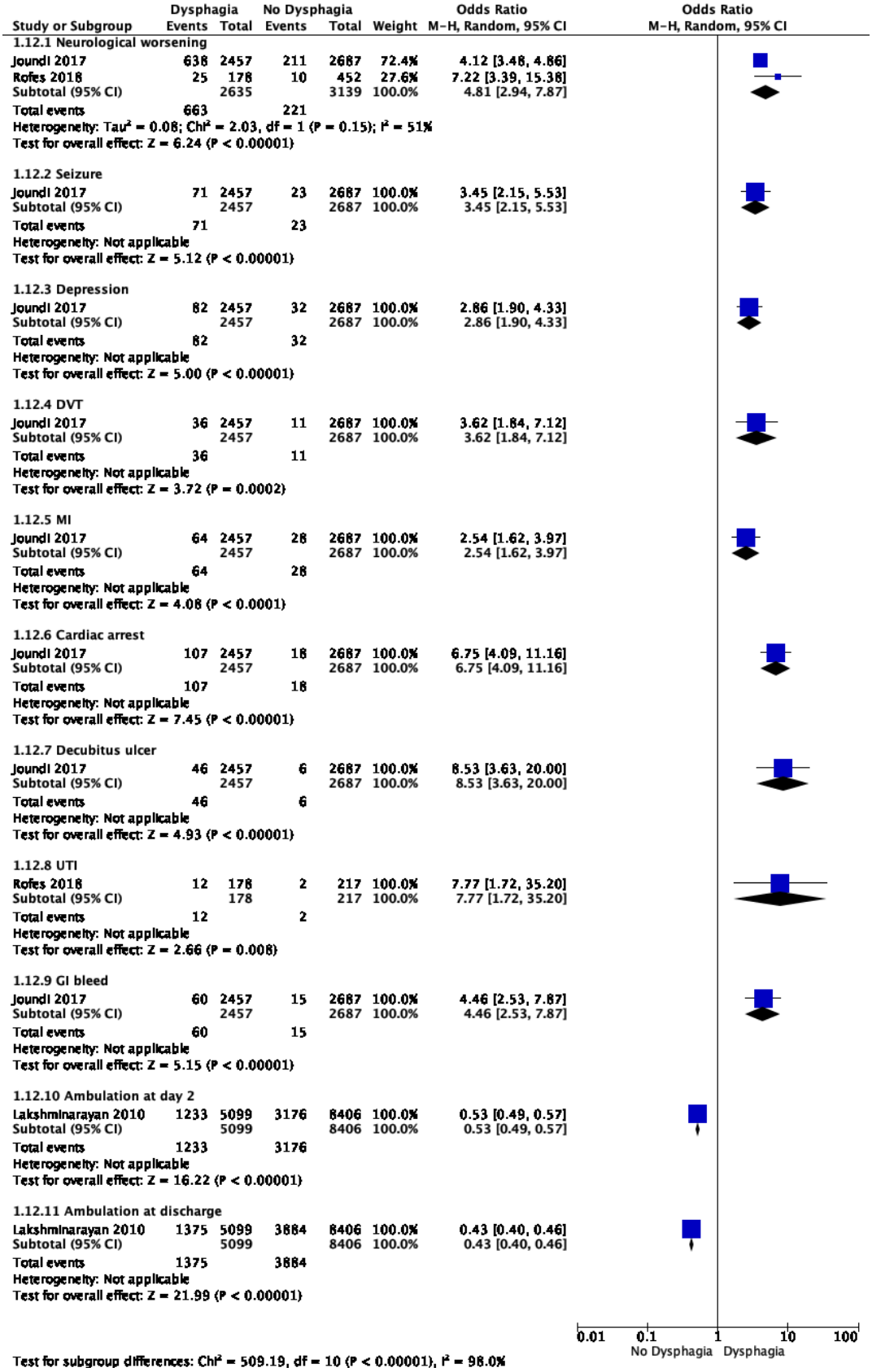
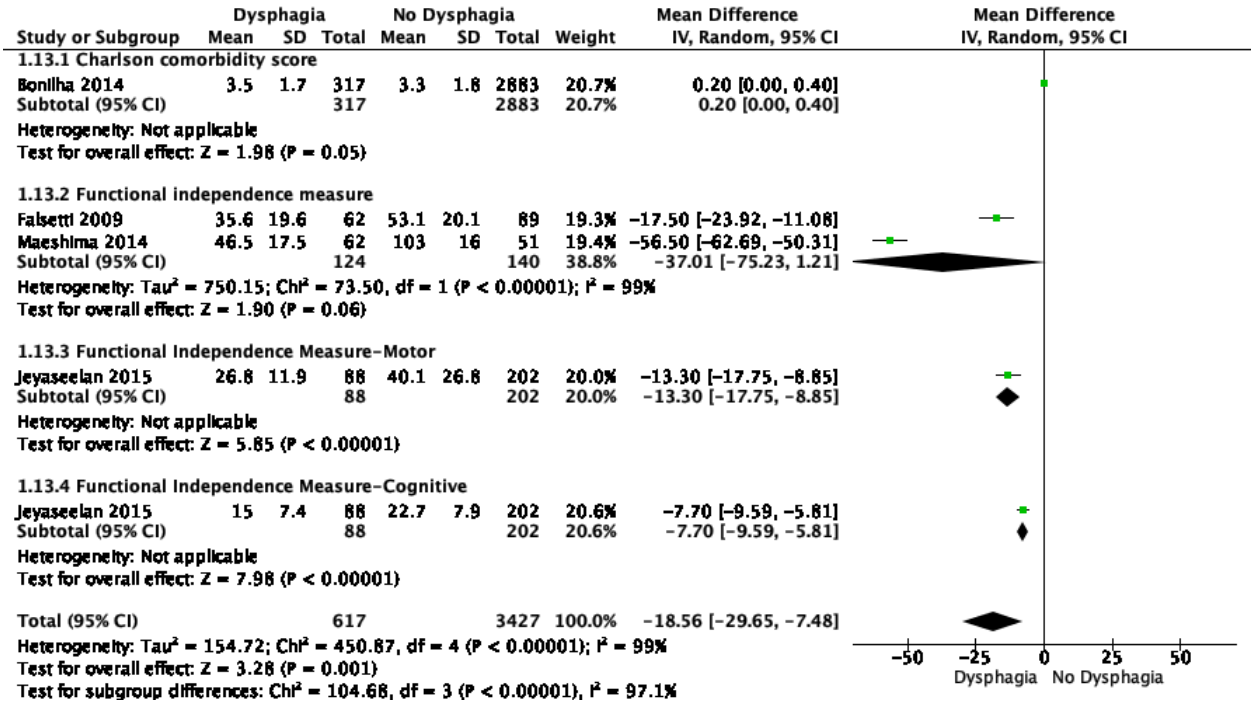


Figure: Effect of dysphagia compared to no dysphagia on Charlson comorbidity and quality of life in patients with stroke



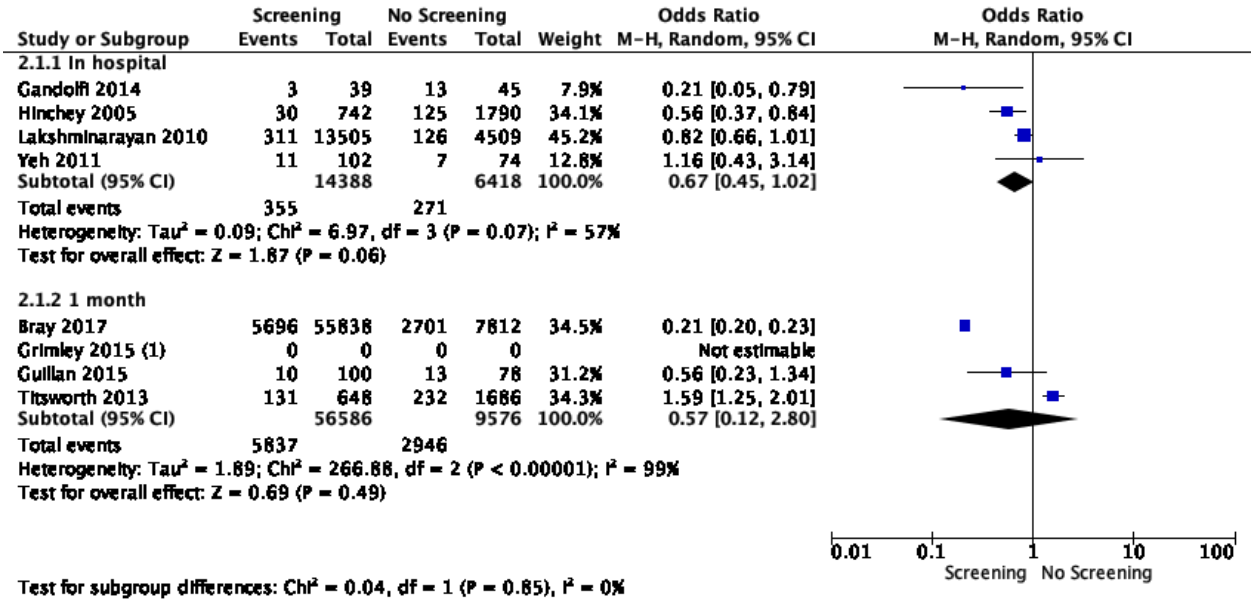
Screening

Table 1: Effect of screening compared to no screening on mortality, pneumonia, length of stay in hospital and discharge in patients with stroke

Outcome	Incidence (%)/ Mean±SD		n (N)	OR [95% CI]/ MD [95% CI]	I^2	P value
	Screening	No Screening				
Mortality						
• **Mortality, hospital**	2%	4%	4(20806)	0.67 [0.45, 1.02]	57%	0.06
• **Mortality, 1 month**	10%	31%	3(66162)	0.57 [0.12, 2.80]	99%	0.49
Pneumonia	7%	10%	11(536650)	0.55 [0.36, 0.83]	99%	0.004
Nasogastric tube, insertion	44%	53%	3(459)	0.86 [0.51, 1.45]	0%	0.58
Endotracheal tube insertion	7%	9%	2(260)	0.66 [0.27, 1.63]	0%	0.37
LOS, days	7.2±6.4	6.2±5.3	5(21005)	0.02 [-2.22, 2.26]	99%	0.99
Barthel Index Score	19.74±29.9	12.89±23.6	1(84)	6.85 [-4.79, 18.49]	NA	0.25
Adverse effects						
• **UTI**	5%	6%	1(67672)	0.79 [0.60, 1.05]	NA	0.10
• **Temperature ≥ 38**	43%	41%	1(176)	1.11 [0.61, 2.04]	NA	0.73
Discharge						
• **Discharged home**	29%	33%	2(20348)	0.84 [0.79, 0.90]	0%	< 0.00001
• **Discharged to Institution**	20%	19%	1(2334)	1.08 [0.86, 1.35]	NA	0.53
• **Skilled nursing facility**	14%	11%	1(2334)	1.27 [0.97, 1.66]	NA	0.09
• **Hospice**	2%	3%	1(2334)	0.78 [0.43, 1.39]	NA	0.39
• **Other hospitals**	6%	5%	1(2334)	1.28 [0.86, 1.92]	NA	0.23
• **Ambulation, 2 days**	33%	44%	1(18014)	0.61 [0.57, 0.66]	NA	< 0.00001
• **Ambulation, at discharge**	39%	42%	1(18014)	0.88 [0.82, 0.94]	NA	0.0002

CI: Confidence intervals; I^2: Heterogeneity; LOS, Length of stay in hospital; MD: Mean difference; n: Number of studies; N: Number of patients; p: Statistical significance value; OR: Odds Ratio; SD: Standard deviation

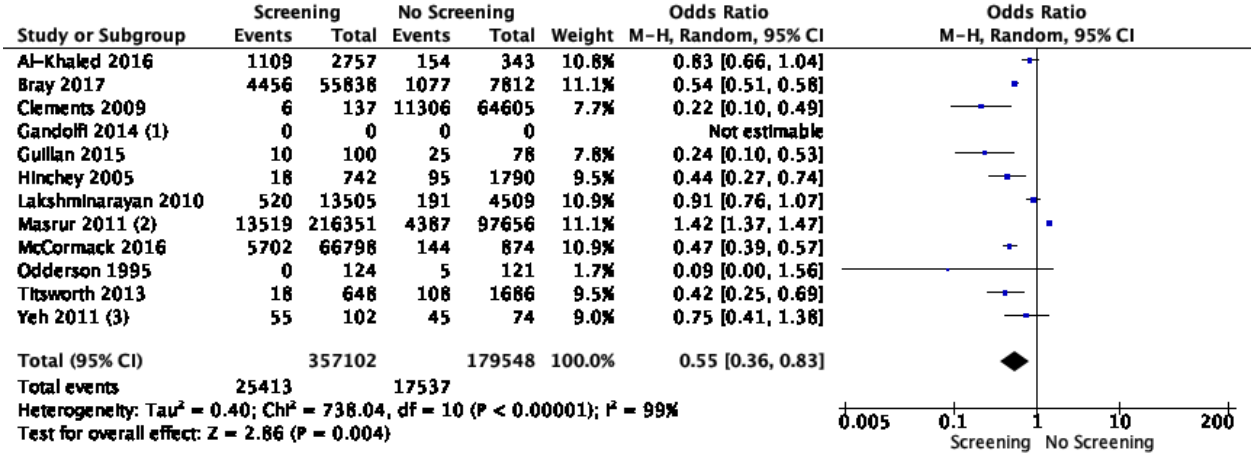
Figure 1: Effect of screening compared to no screening on mortality in patients with stroke



Footnotes

(1) Significantly less with screening p < 0.001 and more alive, OR 4.8; 95% CI 3.5–6.6

Figure 2: Effect of screening compared to no screening on pneumonia in patients with stroke



Footnotes

(1) OR 0.33, 95% CI 0.10–1.03

(2) Patients on NPO were not considered

(3) Adjusted data, dysphagia screening decreased pneumonia; OR 0.42, 95% CI, 0.18–1.00; p=0.05

Figure 3: Effect of screening compared to no screening on intubation and requirement of oxygen in patients with stroke

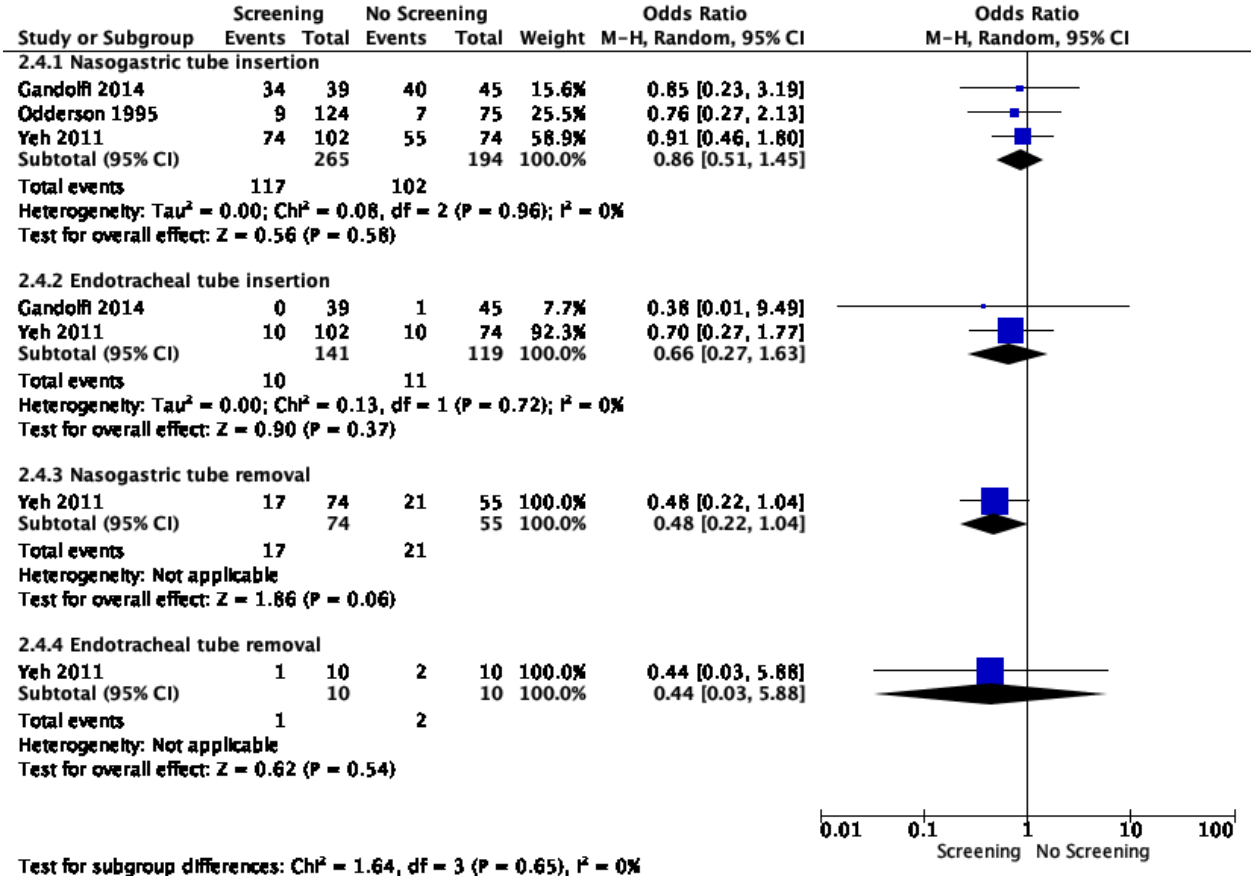


Figure 4: Effect of screening compared to no screening on length of stay in hospital in patients with stroke

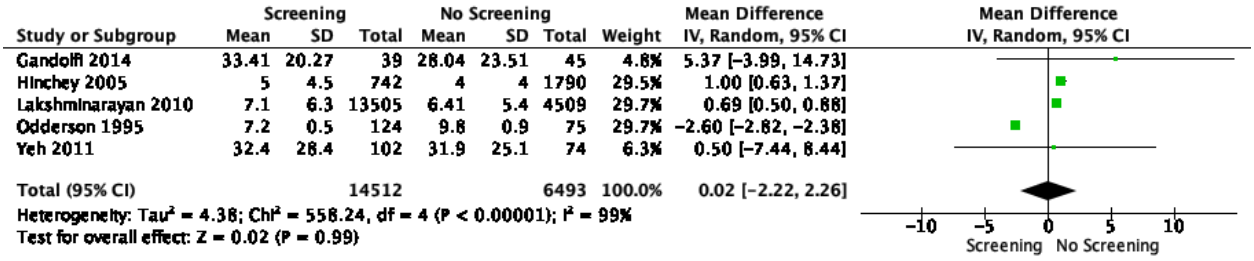


Figure 5: Screening vs no screening and intubation and Barthel index and Rankin score in patients with stroke

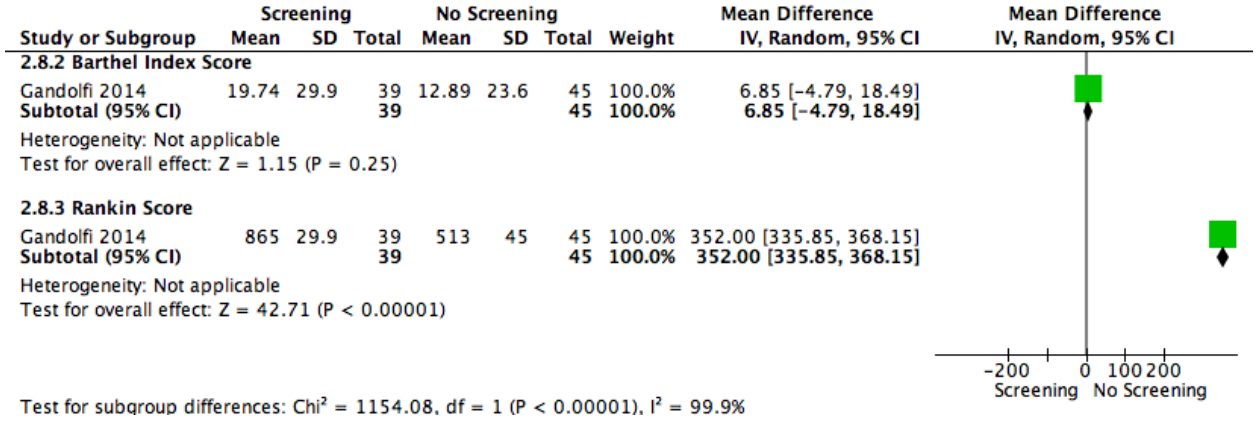


Figure 6: Effect of screening compared to no screening on urinary tract infection and temperature in patients with stroke

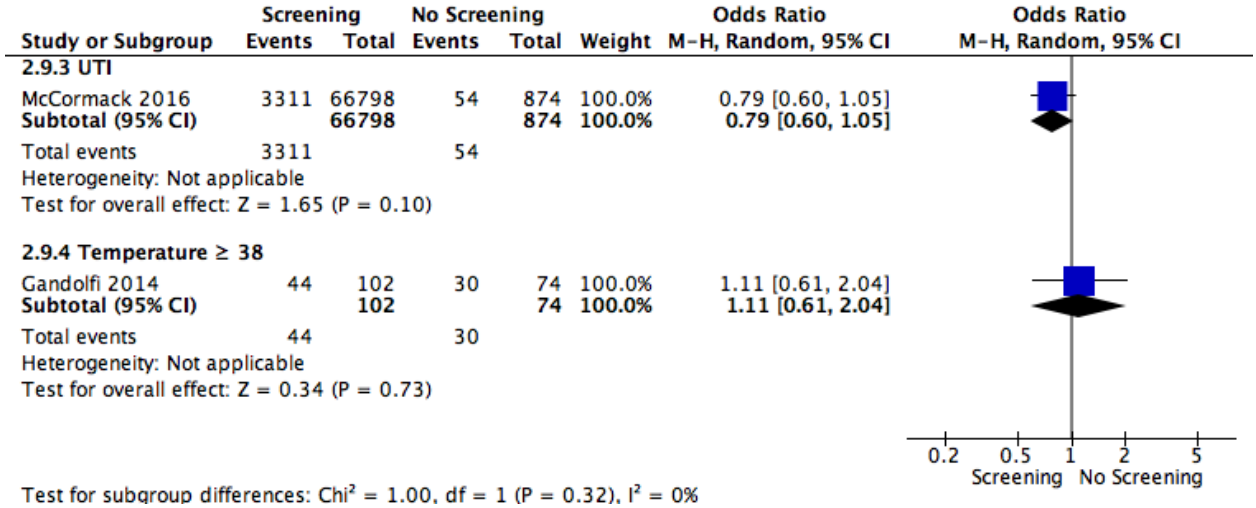


Figure 7: Effect of screening compared to no screening on discharge and ambulation in patients with stroke

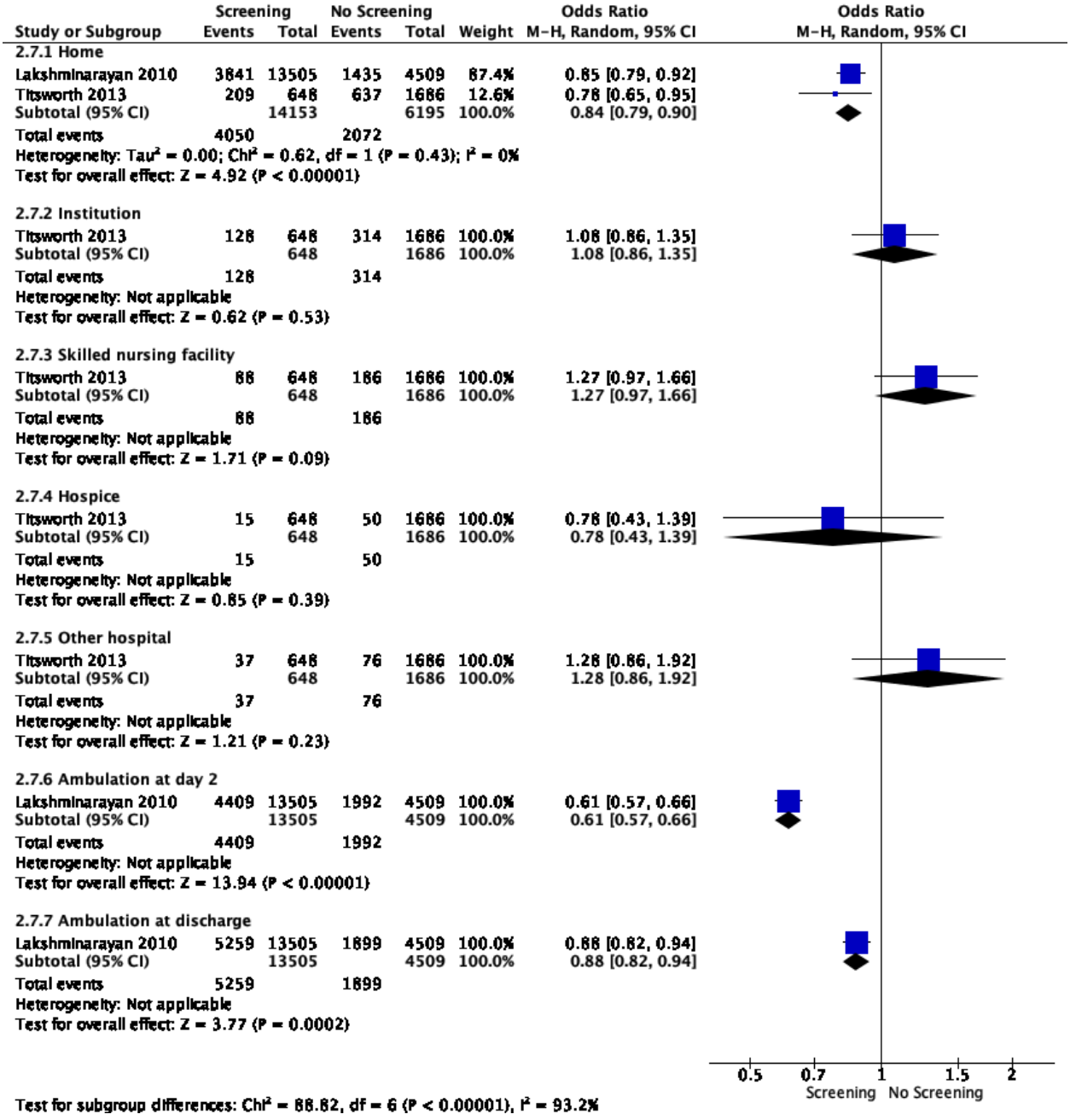
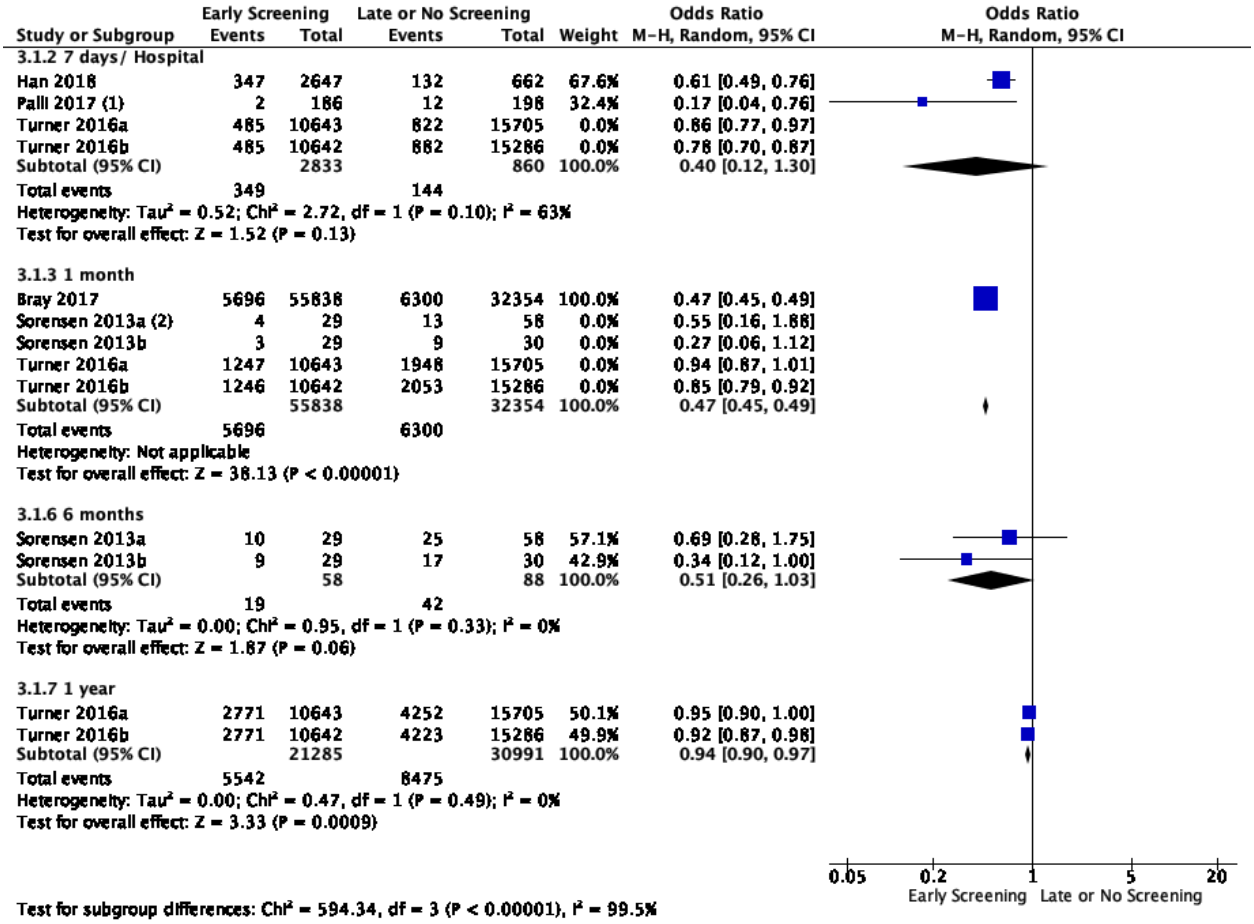


Table 1: Effect of early screening compared to late screening on mortality, pneumonia, length of stay in hospital and discharge in patients with stroke

Outcome	Incidence (%)/ Mean±SD		n (N)	OR [95% CI]/ MD [95% CI]	I^2	P value
	Early Screening	Late Screening				
Mortality						
• **Overall**	15%	23%	7(144307)	0.62 [0.43, 0.91]	99%	0.01
• **Mortality, hospital/ 7 days**	5%	6%	4(55969)	0.74 [0.61, 0.89]	75%	0.002
• **Mortality, 1 month**	11%	16%	5(140614)	0.66 [0.42, 1.02]	99%	0.06
• **Mortality, 6 months**	33%	48%	1(146)	0.51 [0.26, 1.03]	0%	0.06
• **Mortality, 1 year**	26%	27%	2(52276)	0.94 [0.90, 0.97]	0%	0.0009
Pneumonia	9%	15%	10(96367)	0.45 [0.35, 0.58]	83%	< 0.00001
Feeding tube						
• **Nasogastric tube feeding**	38%	52%	2(146)	0.52 [0.26, 1.04]	0%	0.07
• **PEG**	14%	9%	2(146)	1.70 [0.51, 5.74]	8%	0.39
LOS, days	23.8±9.5	27.6±9.2	6(56085)	-2.27 [-3.12, -1.43]	92%	< 0.00001
Barthel Index Score, 1 week	15±36	7±18	1(116)	8.00 [-2.36, 18.36]	NA	0.13
Barthel Index Score, discharge	17±43	12±28	1(116)	5.00 [-8.21, 18.21]	NA	0.46
ADR						
• **UTI**	0%	0%	1(116)	1.15 [0.55, 2.40]	NA	0.71
Discharge						
• **Discharged home**	57%	53%	2(52276)	1.16 [1.08, 1.26]	79%	< 0.0001
• **Readmission**	2%	6%	1(138)	0.35 [0.06, 2.19]	NA	0.69
mRS						
• **mRS, 4-5**	28%	39%	1(3309)	0.59 [0.50, 0.71]	NA	0.00001

CI: Confidence intervals; I^2: Heterogeneity; LOS, Length of stay in hospital; MD: Mean difference; n: Number of studies; N: Number of patients; p: Statistical significance value; PEG: Percutaneous endoscopic gastrostomy; OR: Odds Ratio; SD: Standard deviation

Figure 1: Effect of early vs late screening for dysphagia on mortality in patients with stroke



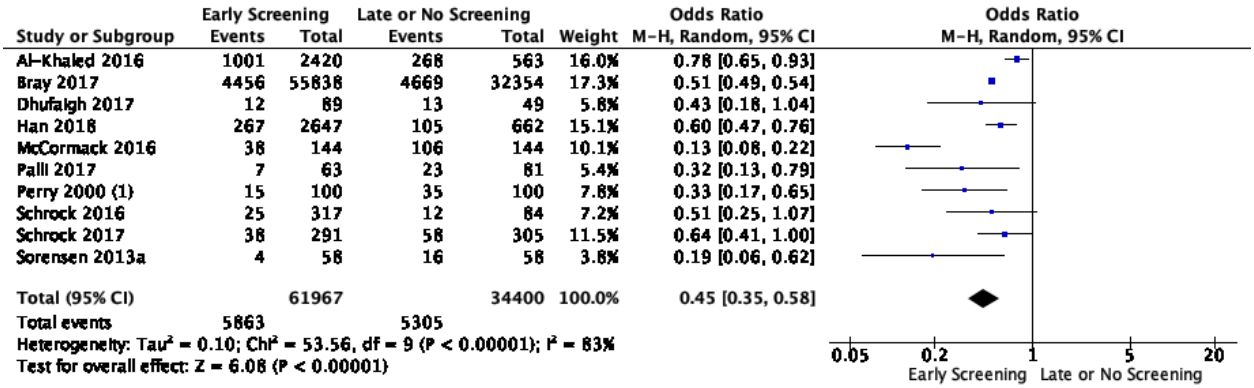
Test for subgroup differences: Chi² = 594.34, df = 3 (P < 0.00001), I² = 99.5%

Footnotes

(1) Gugging Swallowing Screen 24/7 dysphagia screening vs speech-language therapists during regular working hours

(2) Dysphagia screeing within 24 hours 98% vs 72%

Figure 2: Effect of early vs late screening for dysphagia on pneumonia in patients with stroke



Footnotes

(1) Following the guideline of early screening for dysphagia vs no (3 vs 4 days)

Figure 3: Effect of early vs late screening for dysphagia on nasogastric tubing or percutaneous gastroscopy in patients with stroke

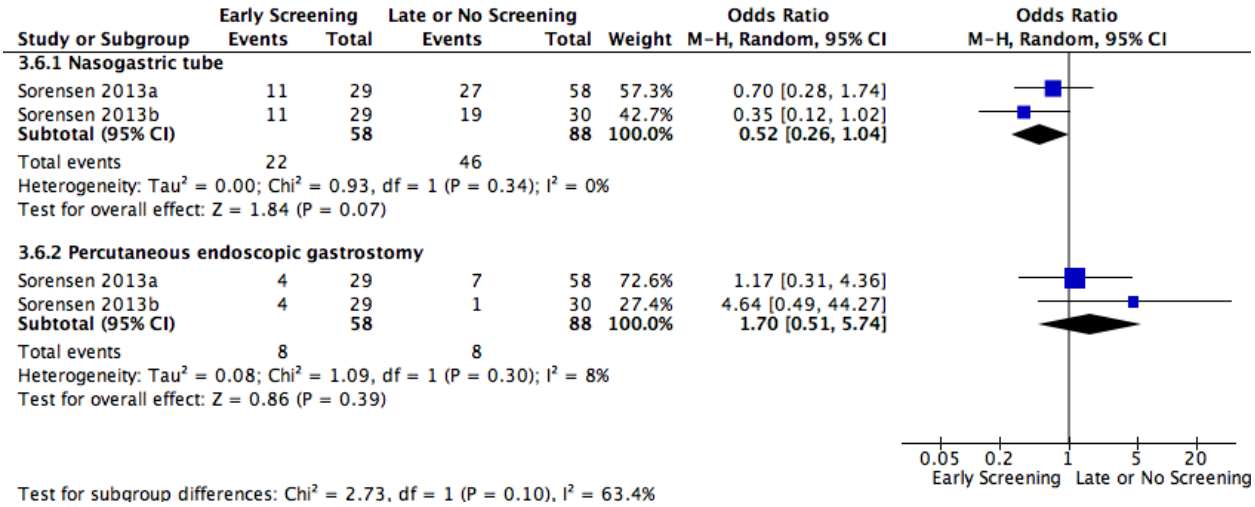
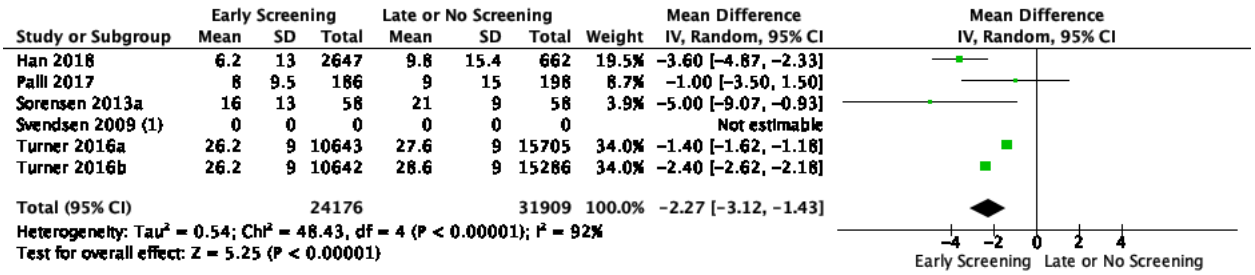


Figure 4: Effect of early vs late screening for dysphagia on length of stay in patients with stroke



Footnotes
(1) Higher quality of care (Screening and other interventions) are associated with shorter LOS

Figure 5: Effect of early vs late screening for dysphagia on Barthel score in patients with stroke

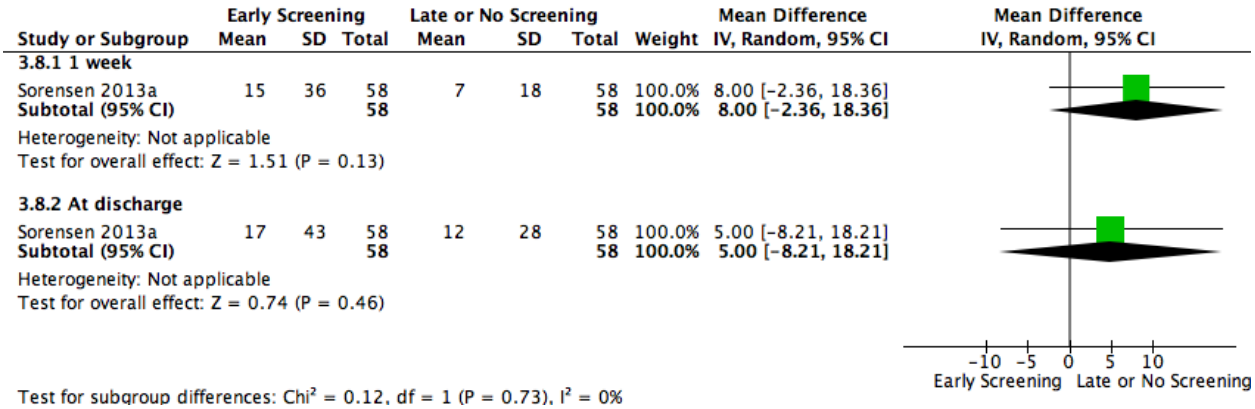


Figure 6: Effect of early vs late screening for dysphagia on urinary tract infectors in patients with stroke

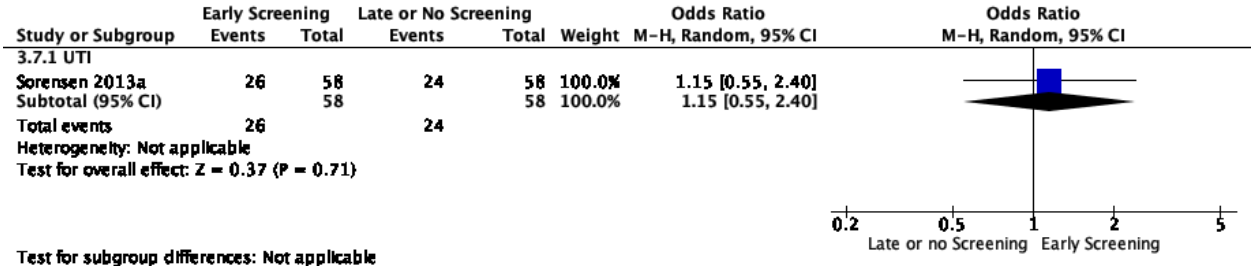


Figure 7: Effect of early vs late screening for dysphagia on discharge and readmission in patients with stroke

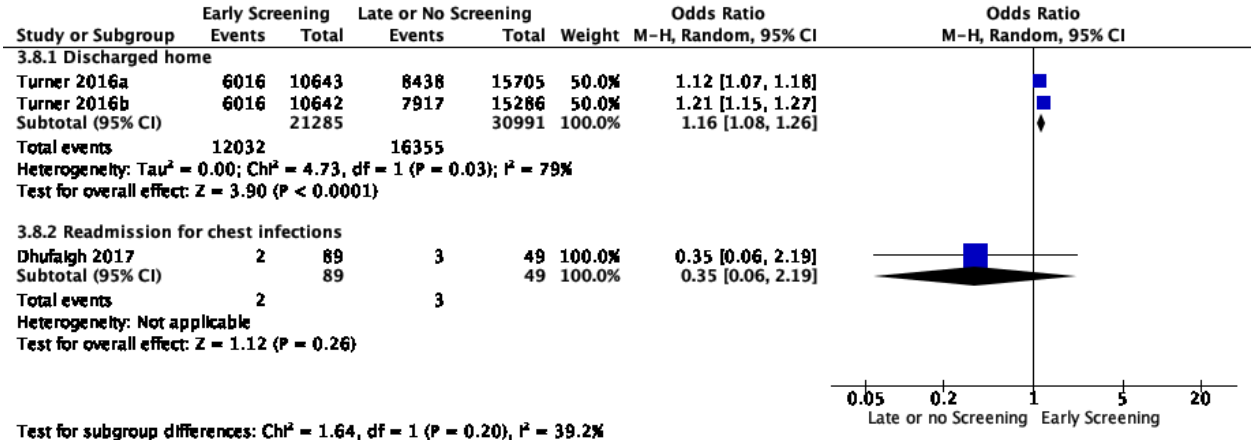
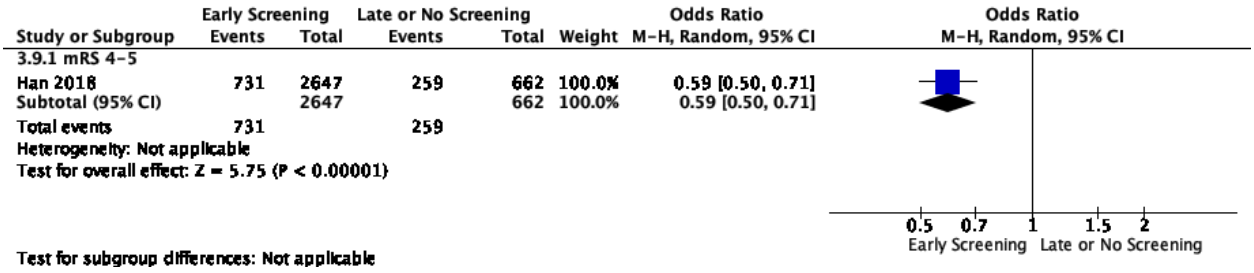


Figure 8: Effect of early vs late screening for dysphagia on mRS in patients with stroke



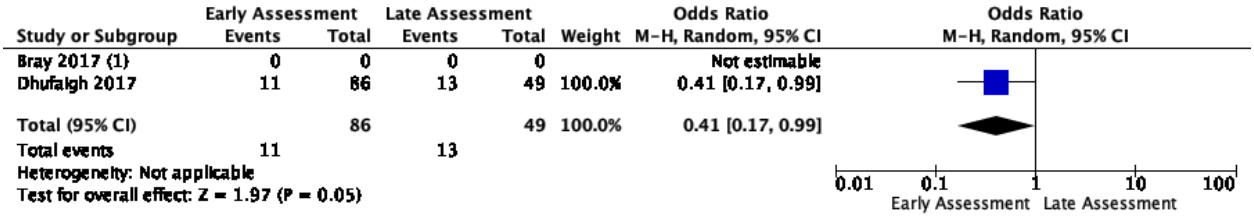
Assessment

Table 1: Effect of early assessment compared to late assessment on pneumonia and discharge in patients with stroke

Outcome	Incidence (%)/ Mean±SD		n (N)	OR [95% CI]/ MD [95% CI]	I^2	P value
	Early assessment	Late assessment				
Pneumonia	NR*	40%-100% more compared to early	1(24542)	0.60 (0.40-0.78) at < 6 hr vs 2-24 hr 0.40 (0.16-0.59) at < 6 hr vs 24-48 hr	NA	<0.0001 <0.0001
	12.8%**	26.5%	1(135)	0.41 [0.17, 0.99]	NA	0.05
Improvement of dysphagia	1.5	0.6	1(135)	Not reported	NA	NA

*: Bray 2017; **: Dhufaigh 2017; CI: Confidence intervals; I^2: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; OR: Odds Ratio; SD: Standard deviation

Figure 1: Pneumonia with early or late assessment of dysphagia in patients with acute or subacute stroke



Footnotes
(1) Early vs late: OR: 0.60 (0.40–0.78) at < 6 hr vs 6–24 hr; OR: 0.40 (0.16–0.59) at < 6 hr vs 24–48 hr

Figure 2: Improvement in Dysphagia with early or late assessment of dysphagia in patients with acute or subacute stroke

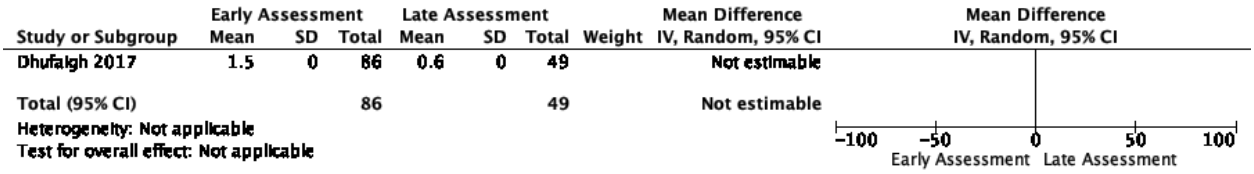


Table 2: Effect of clinical bedside assessment compared to instrumental assessment on mortality, pneumonia tube removal, discharge and LOS in patients with stroke

Outcome	Incidence (%)		n (N)	OR [95% CI]	I^2	P value
	Clinical bedside assessment	Instrumental assessment				
Mortality	10.5%	7.3%	1(440)	1.49 [0.76, 2.90]	NA	0.24
Pneumonia	12.3%	6.4%	1(440)	2.06 [1.05, 4.04]	NA	0.04
Correct judgement in Tube removal	62.5.0%	100%	1(32)	0.05 [0.00, 0.96]	NA	0.05
Discharge, home	43.6%	46.4%	1(440)	0.90 [0.62, 1.30]	NA	0.57
Discharge, on standard diet	51.1%	65.6%	1(378)	0.47 [0.31, 0.71]	NA	0.004
LOS, days	17.3±15.2	23.7±20.2	1(440)	-6.33 [-9.67, -2.99]	NA	0.0002

CI: Confidence intervals; I^2: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; OR: Odds Ratio

Figure 3: Effect of clinical bedside assessment compared to instrumental assessment on mortality in patients with stroke

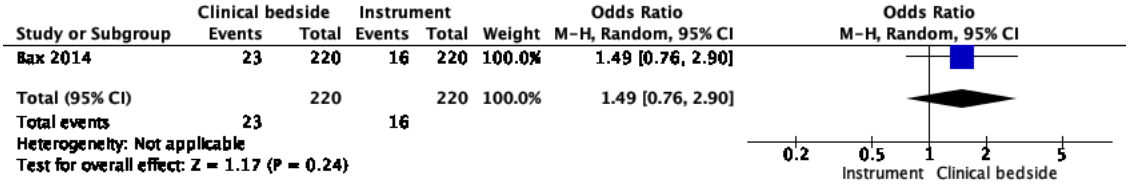


Figure 4: Effect of clinical bedside assessment compared to instrumental assessment on pneumonia in patients with stroke

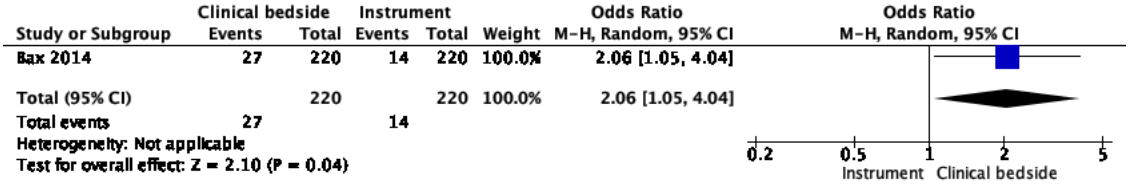


Figure 5: Effect of clinical bedside assessment compared to instrumental assessment on discharge in patients with stroke

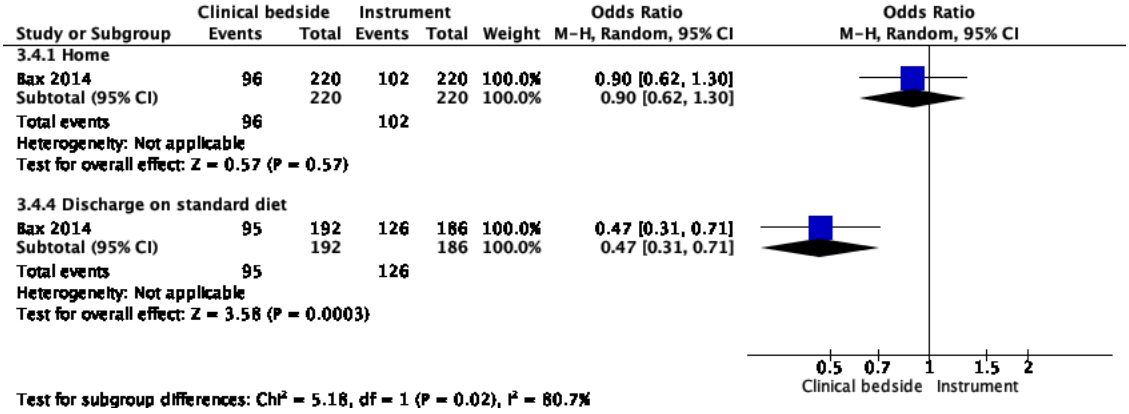


Figure 6: Effect of clinical bedside assessment compared to instrumental assessment on length of stay in hospital in patients with stroke

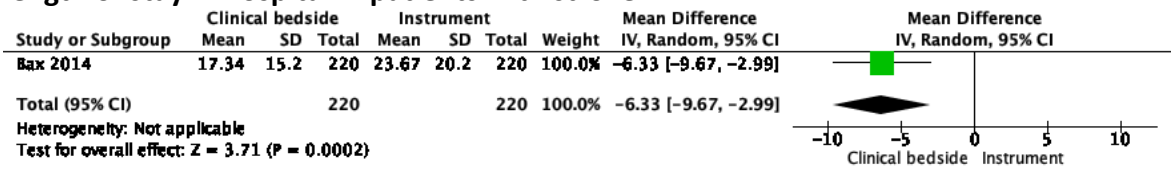


Table 3: Effect of clinical bedside assessment compared to instrumental assessment in patients with stroke

Outcome	Incidence (%)		n (N)	OR [95% CI]	I^2	P value
	Instrumental assessment with VFSS	FEES				
Pneumonia	29.2%	4.8%	1(45)	8.24 [0.92, 73.79]	NA	0.06
PEG	2.6%	23.8%	1(99)	0.08 [0.01, 0.47]	NA	0.005

CI: Confidence intervals; Diet: Non-oral feeding: 1-3; FEES: fiberoptic endoscopic evaluation of swallowing; Oral diets: 4-7; I^2: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; PEG: Percutaneous endoscopic gastrostomy; OR: Odds Ratio

Figure 8: Pneumonia with videofluoroscopy (VFSS) compared to fiberoptic endoscopic evaluation of swallowing (FEES) in patients with stroke

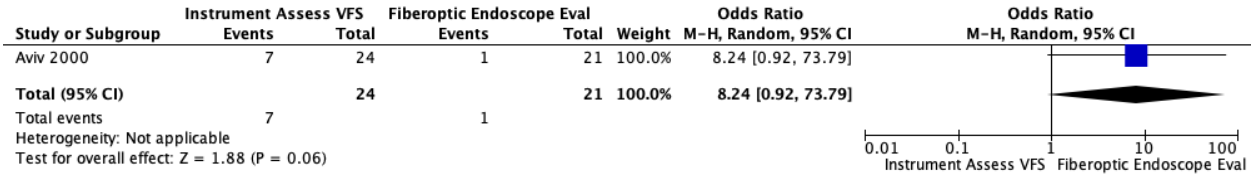
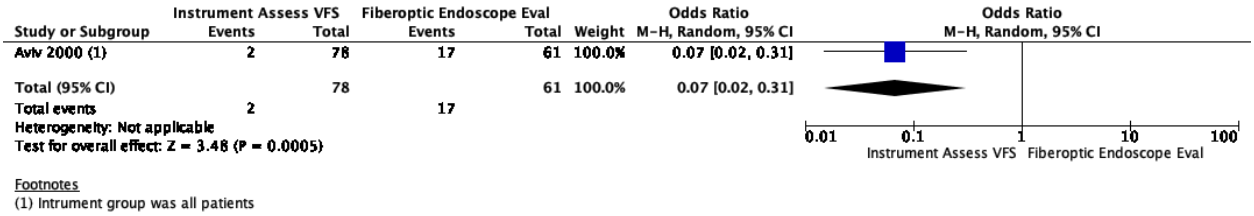


Figure 9: Percutaneous endoscopic gastrostomy with videofluoroscopy (VFSS) compared to fiberoptic endoscopic evaluation of swallowing (FEES) in patients with stroke



Footnotes
(1) Intrument group was all patients

Table 4: Effect of Complementary and standard assessment in patients with acute or subacute stroke

Outcome	Incidence (%)/ Mean±SD		n (N)	OR [95% CI]/ MD [95% CI]	I^2	P value
	Complementary and standard assessment	Standard assessment				
Mortality	13.5%	19.6%	1(311)	0.64 [0.35, 1.18]	NA	0.15
Pneumonia	25.7%	21.5%	1(311)	1.26 [0.75, 2.14]	NA	0.38
Independence						
• At home	48.6%	44.8%	1(311)	1.17 [0.75, 1.83]	NA	0.50
• At residential care	43.2%	45.4%	1(311)	0.92 [0.59, 1.43]	NA	0.70
• At public hospital	8.1%	9.8%	1(311)	0.81 [0.37, 1.78]	NA	0.60
Length of stay	7±5.2	6±5.2	1(311)	1.00 [-0.16, 2.16]	NA	0.09
FOIS	6.2±1.2	6±1.3	1(311)	0.20 [-0.08, 0.48]	NA	0.16

CI: Confidence intervals; Diet: Non-oral feeding: 1-3; Oral diets: 4-7; I^2: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; OR: Odds Ratio; SD: Standard deviation

Figure 10: Mortality with full clinical and instrumental assessment compared to no assessment in patients with acute or subacute stroke

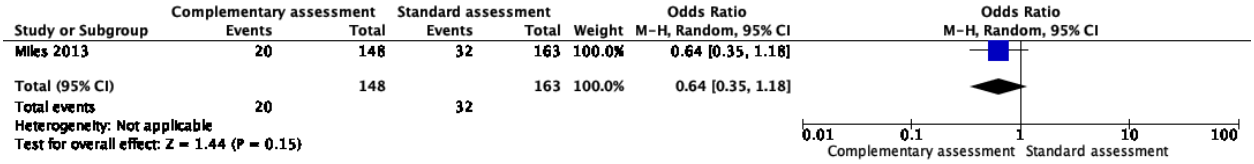


Figure 11: Pneumonia with full clinical and instrumental assessment compared to no assessment in patients with acute or subacute stroke

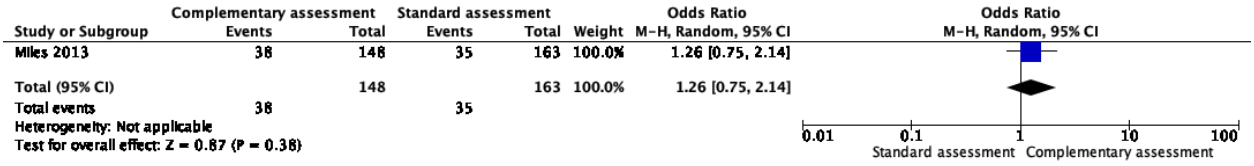


Figure 12: Independence at home, residential or hospital with full clinical and instrumental assessment compared to no assessment in patients with acute or subacute stroke

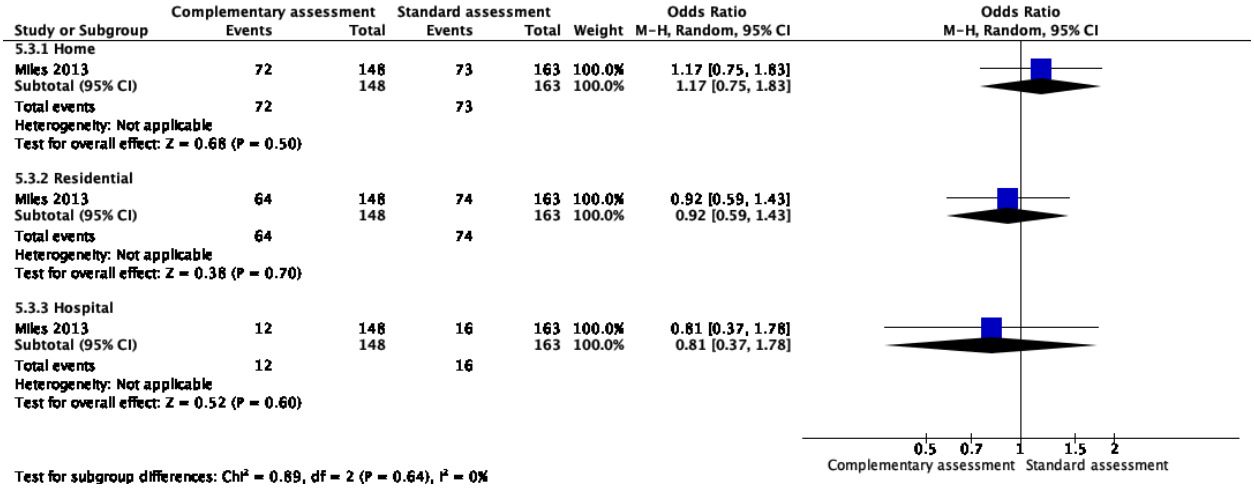
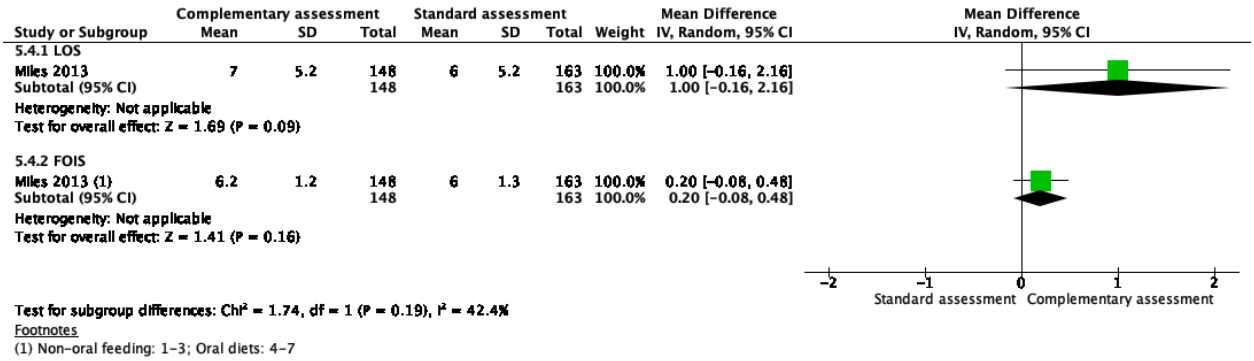


Figure 13: Length of stay and diet with full clinical and instrumental assessment compared to no assessment in patients with acute or subacute stroke



Footnotes

(1) Non-oral feeding: 1-3; Oral diets: 4-7

Treatment 1 – Dietary Interventions

Table 1: Effect of consistency modification on pneumonia, dysphagia at end, penetration, UTI and satisfaction in patients with dysphagia after stroke

Outcome	Incidence %		n (N)	RR [95% CI]/	I^2	P value
	Consistency modification	Control				
Pneumonia						
• RCT	0.0%	20.0%	4(100)	0.19 [0.03, 1.40]	0%	0.1
Dysphagia at end						
• RCT	33.3%	84.8%	64	0.40 [0.20, 0.77]	0%	0.006
Penetration						
• RCT	0.0%	13.1%	1(122)	0.06 [0.00, 1.00]	NA	0.05
UTI*						
• RCT	NR	NR	NR	NR	NR	.024
Aspiration						
• RCT	21.3%	45.7%	188	0.51 [0.14, 1.77]	90%	0.29
Satisfaction**						
• RCT	NR	NR	NR	NR	NR	0.414

*: Higher proportion in thickened compared to water protocol; **: Water protocol vs thickened; CI: Confidence intervals; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; p: Statistical significance value

Figure 1: Pneumonia (Data from RCTs)

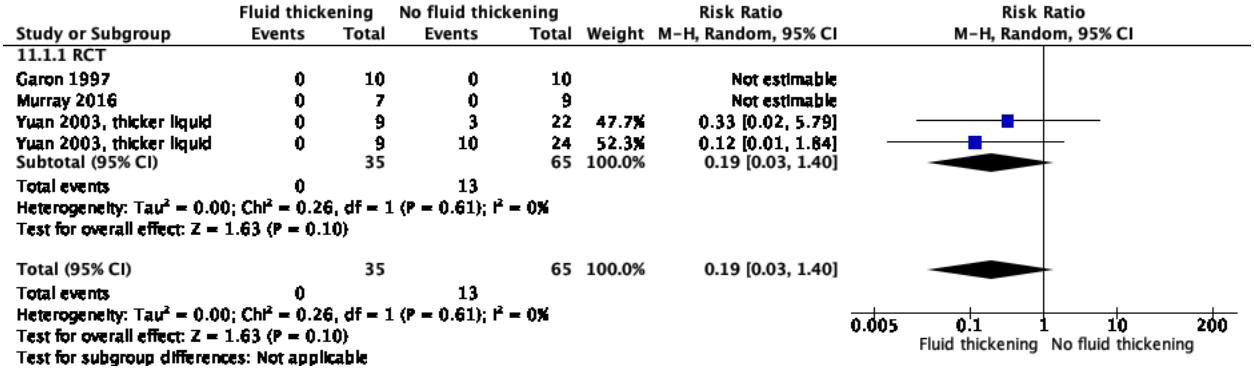
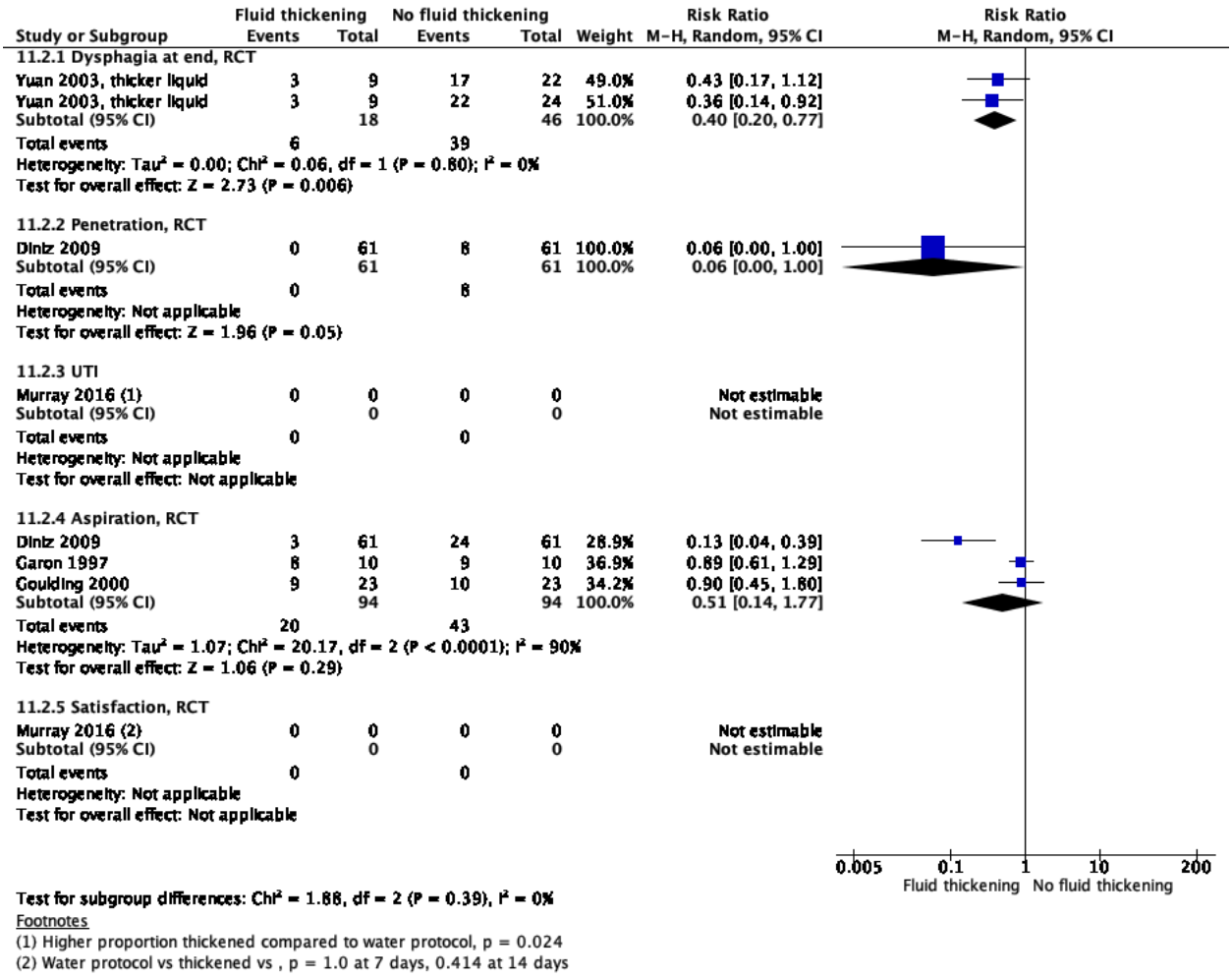


Figure 2: Dysphagia and penetration with thick fluid in patients with stroke and dysphagia (Data from RCTs)



Test for subgroup differences: Chi² = 1.88, df = 2 (P = 0.39), I² = 0%

Footnotes

(1) Higher proportion thickened compared to water protocol, p = 0.024

(2) Water protocol vs thickened vs , p = 1.0 at 7 days, 0.414 at 14 days

Table 2: Length of stay in hospital, time to resolution of dysphagia and length of days of no aspiration with thick fluid in patients with stroke and dysphagia

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Fluid thickening	Control				
LOS in hospital, days						
• RCT	24±9	34±12	1(64)	-9.58 [-15.41, -3.76]	19%	0.001
Time to resolution of dysphagia						
	38±29	27±13	1(14)	11.00 [-13.89, 35.89]	NA	0.39
Days of no aspiration						
• RCT	39±19	33±11	1(20)	6.10 [-7.17, 19.37]	NA	0.37

CI: Confidence intervals; I^2, p: Heterogeneity; LOS: Length of stay; MD: Mean difference; n: Number of studies; N: Number of patients; p: Statistical significance value; SD: Standard Deviation

Figure 3: Length of stay in hospital, time to resolution of dysphagia and length of days of no aspiration with thick fluid in patients with stroke and dysphagia

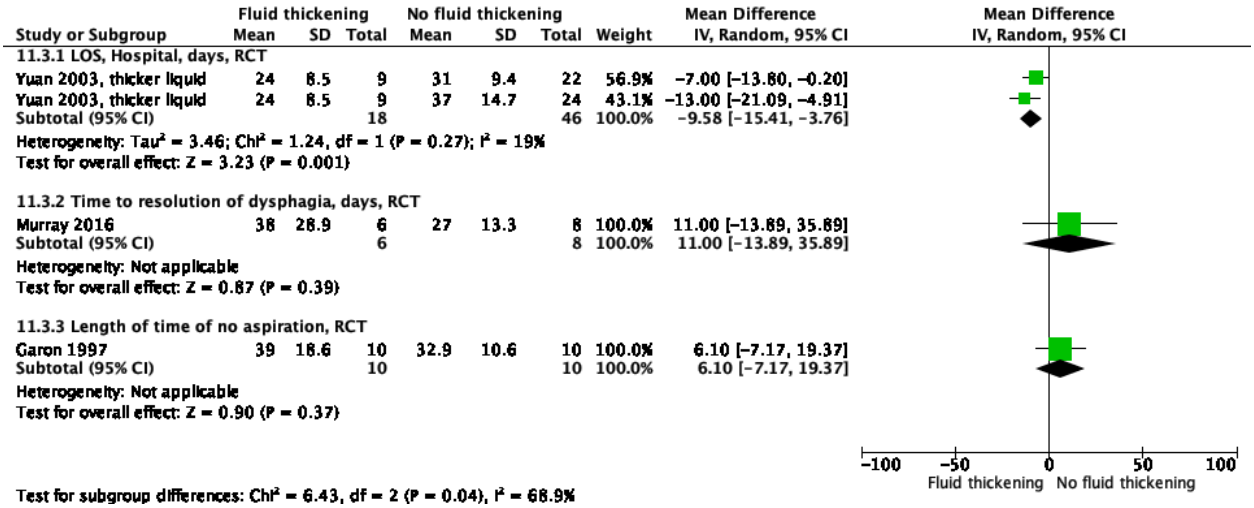


Table 3: Effect of fluid thickening on albumin in patients with dysphagia after stroke

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Fluid thickening	Control				
Albumin						
• RCT	37.0±6.7	36.7±10.0	1(64)	0.30 [-3.94, 4.55]	0%	0.89
BUN/Cr ratio						
RCT	25±13	20±4	1(14)	5.00 [-5.76, 15.76]	NA	0.36
Fluid intake						
Oral thickened fluid						
• Overall	1004±486	785±162	2(27)	225.22 [-52.84, 503.28]	0%	0.11
• RCT	1028±486	807±162	1(14)	221.00 [-183.75, 625.75]	NA	0.28
• NRCT	984±486	755±162	1(13)	229.00 [-153.65, 611.65]	NA	0.24
• **Enteral + oral fluid**						
• NRCT	4142±486	755±162	1(13)	3387.00 [3004.35, 3769.65]	NA	<0.00001
Water/ thin liquid						
• Overall	698±255	1100±602	2(53)	-324.95 [-578.81, -71.08]	44%	0.01
• RCT	71±70	299±274	1(14)	-228.00 [-425.96, -30.04]	NA	0.02
• NRCT	907±317	1405±727	1(39)	-498.00 [-841.70, -154.30]	NA	0.005
Fluid intake						
• Overall	1179±235	1612±455	3(77)	-133.22 [-541.90, 275.46]	94%	0.52
• RCT	745±164	649±172	2(38)	140.48 [-41.56, 322.51]	68%	0.13
• NRCT	1589±302	2575±737	1(39)	-986.00 [-1330.71, -641.29]	NA	<0.0001

CI: Confidence intervals; I^2, p: Heterogeneity; LOS: Length of stay; MD: Mean difference; n: Number of studies; N: Number of patients; p: Statistical significance value; SD: Standard Deviation

Figure 4: Effect of thickened fluid on albumin and BUN/Cr ratio in patients with stroke and dysphagia

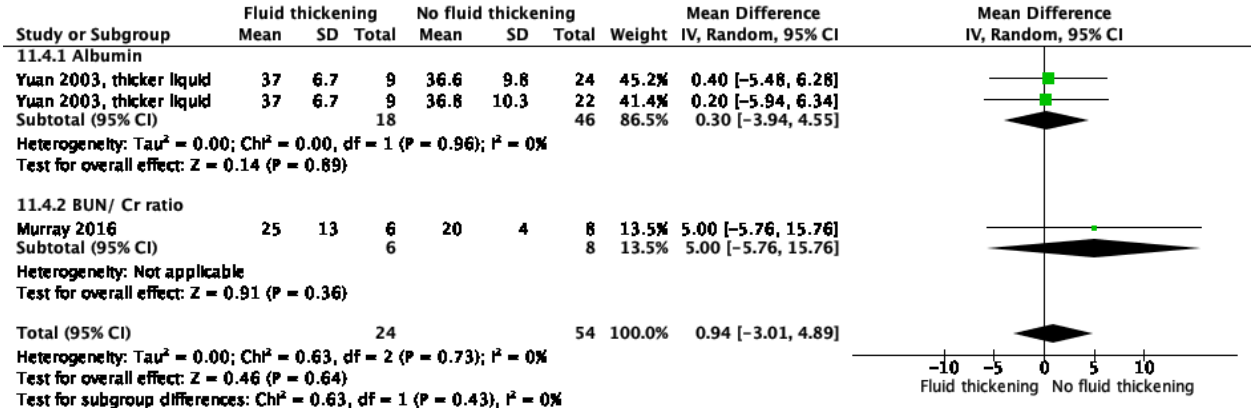
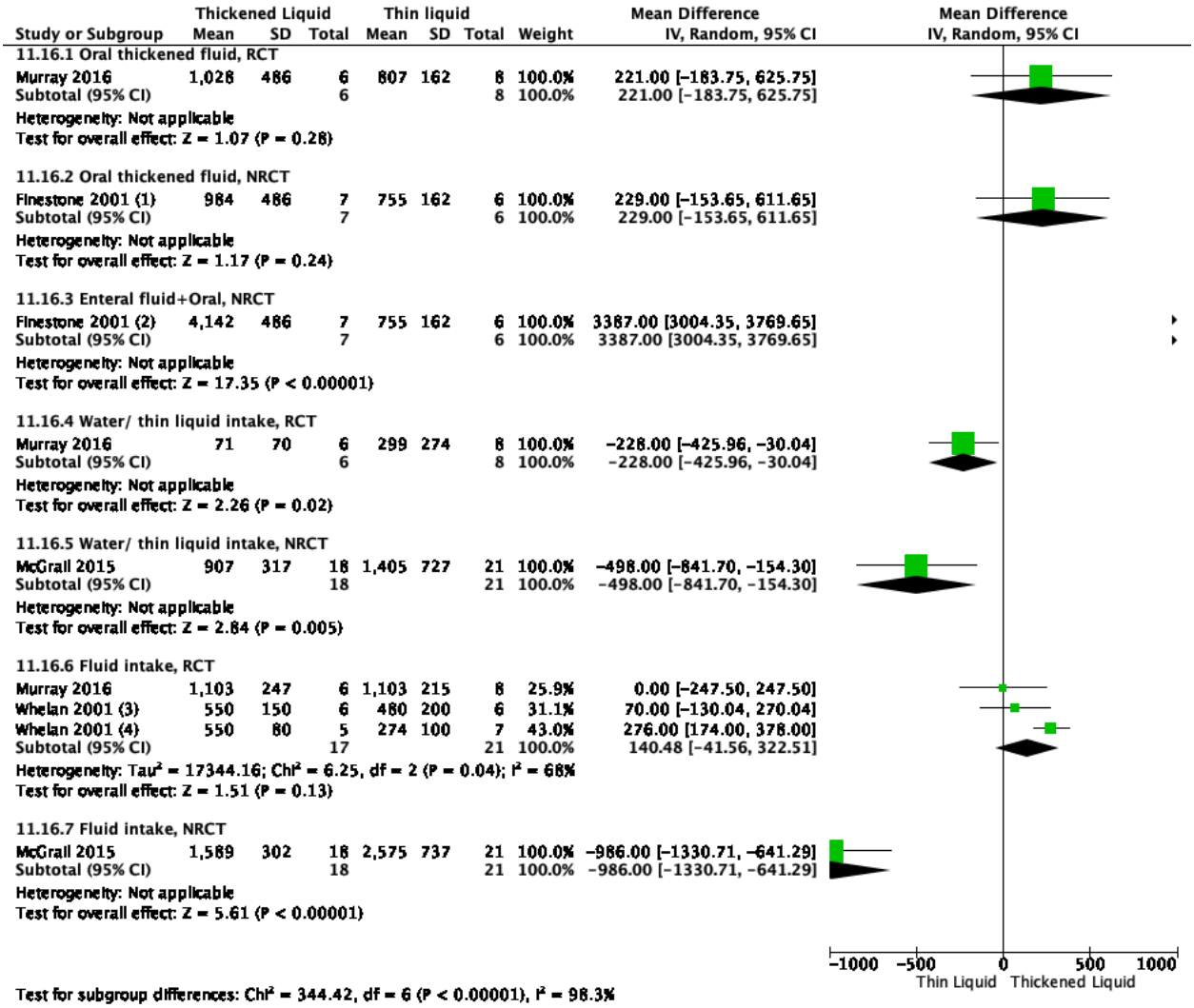


Figure 5: Effect of thickened fluid on fluid intake in patients with stroke and dysphagia



Test for subgroup differences: Chi² = 344.42, df = 6 (P < 0.00001), I² = 98.3%

Footnotes

(1) Intervention group also received 3158 mL of enteral fluid
(2) Intervention group also received 3158 mL of enteral fluid
(3) Stroke unit, Prethickened vs powdered thickened
(4) Non-specialist ward, Prethickened vs powdered thickened

Table 4: Effect of Dysphagia/texture modified diet on energy and protein intake in patients with post-stroke dysphagia

Outcome	Mean ± SD		n (N)	MD [95% CI]	I^2	P value
	Dysphagia diet/Texture modification	Regular diet/No Texture modification				
Energy intake, Kcl/kg/day						
• NRCT	19.4±6.2	22.3±9.0	1(52)	-2.90 [-7.09, 1.29]	NA	0.18
Protein intake, g/kg/day						
• NRCT	0.71±0.29	0.90±0.31	1(68)	-0.19 [-0.34, -0.04]	NA	0.02

CI: Confidence intervals; I^2,p: Heterogeneity; MD: Mean differences; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RR: Risk Ratio; SD: Standard deviation

Figure 6: Energy intake (Kcl/kg/day) with texture modified diet in patients with post-stroke dysphagia

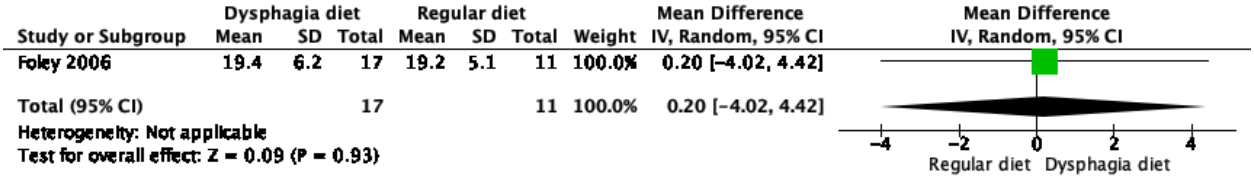
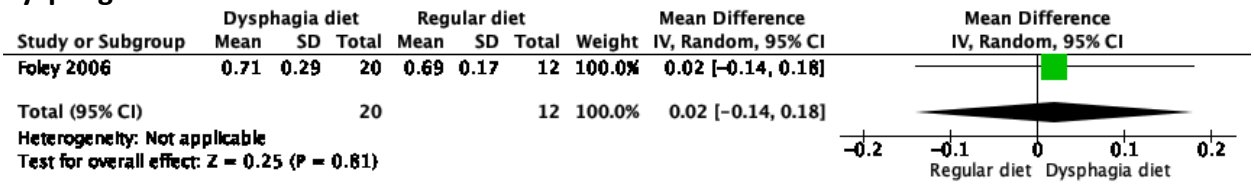


Figure 7: Protein intake (g/kg/day), with texture modified diet in patients with post-stroke dysphagia



Treatment 2a – Behavioural Interventions

Table 1: Effect of behavioural therapy on dysphagia scores in patients with dysphagia after stroke

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Behavior	Control				
Improvement in dysphagia scores						
• Overall	6.4±3.6	4.1±3.5	18(510)	1.18 [0.78, 1.57]	70%	<0.00001
• RCT	5.0±2.9	3.0±2.8	16(440)	0.97 [0.64, 1.30]	68%	<0.00001
• EMST, RCT	1.4±1.3	0.7±1.4	4(108)	0.99 [0.51, 1.47]	16%	< 0.0001
• Swallowing exercises, overall	7.6±4.2	5.1±4.1	14(402)	1.01 [0.67, 1.34]	73%	<0.00001
• Swallowing exercises, RCT	6.1±3.4	3.9±3.3	12(332)	1.19 [0.68, 1.69]	73%	<0.00001
• Swallowing exercises, NRCT	15.5±8.4	10.5±7.3	2(70)	3.11 [-0.12, 6.34]	40%	0.06
Post intervention, dysphagia scores						
• Overall	11.3±4.1	14.2±4.2	19(555)	-1.44 [-2.28, -0.60]	90%	0.0008
• RCT	8.8±3.5	11.1±3.7	17(485)	-0.82 [-1.05, -0.59]	0%	<0.00001
• EMST, RCT	3.8±1.3	4.6±1.4	4(109)	-0.81 [-1.22, -0.39]	14%	0.0001
• Swallowing exercises, overall	13.0±4.7	16.7±4.9	15(485)	-1.66 [-2.87, -0.45]	92%	0.007
• Swallowing exercises, RCT	10.2±4.1	13.2±4.4	13(376)	-0.84 [-1.14, -0.54]	0%	<0.00001
• Swallowing exercises, NRCT	29.4±8.2	34.1±7.2	2(70)	-6.71 [-8.51, -4.91]	14%	<0.00001

CI: Confidence intervals; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; NRCT: Non-randomized controlled trial; p: Statistical significance value; SD: Standard Deviation; MD: Mean Difference; RCT: Randomized controlled trial

Figure 1: Improvement in dysphagia scores with behavior therapy in patients with dysphagia after stroke

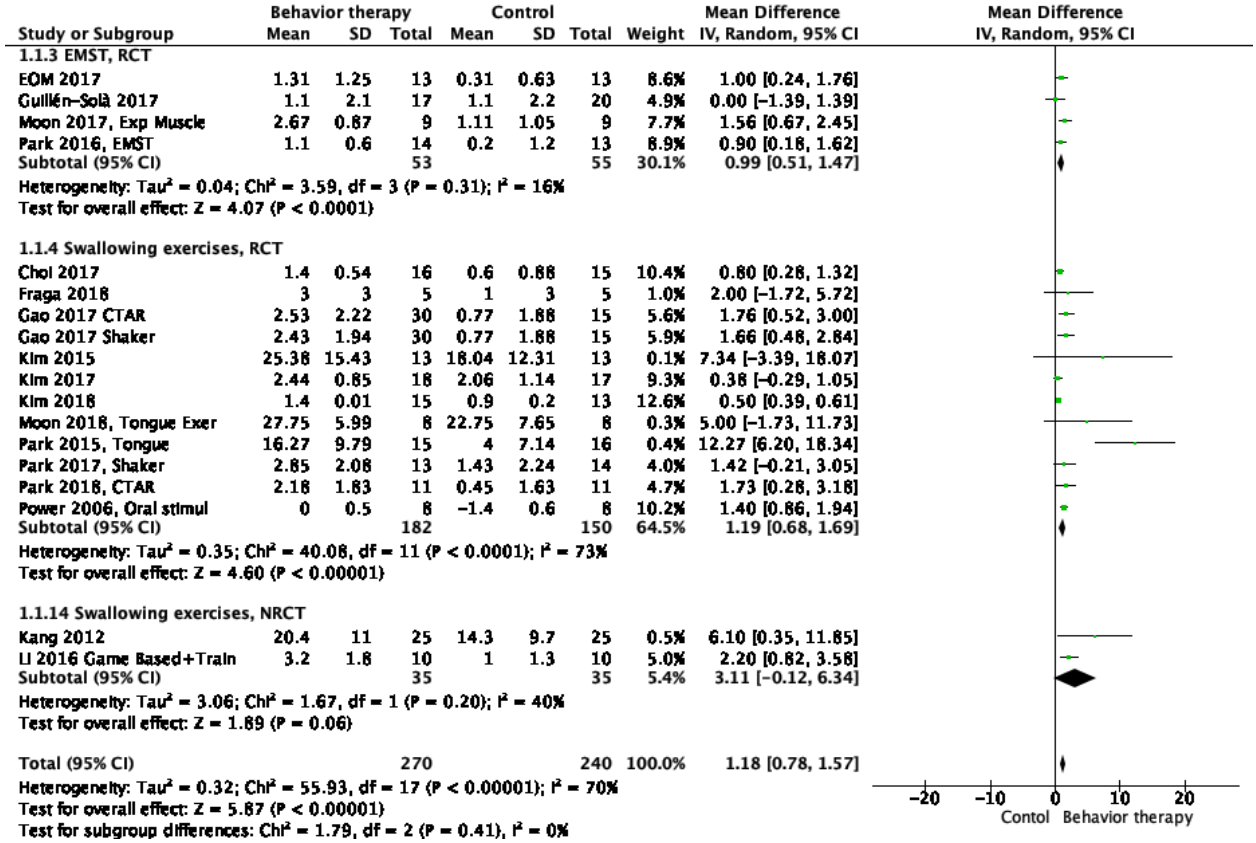


Figure 2: Improvement in dysphagia scores with different kinds of behavior therapy in patients with dysphagia after stroke

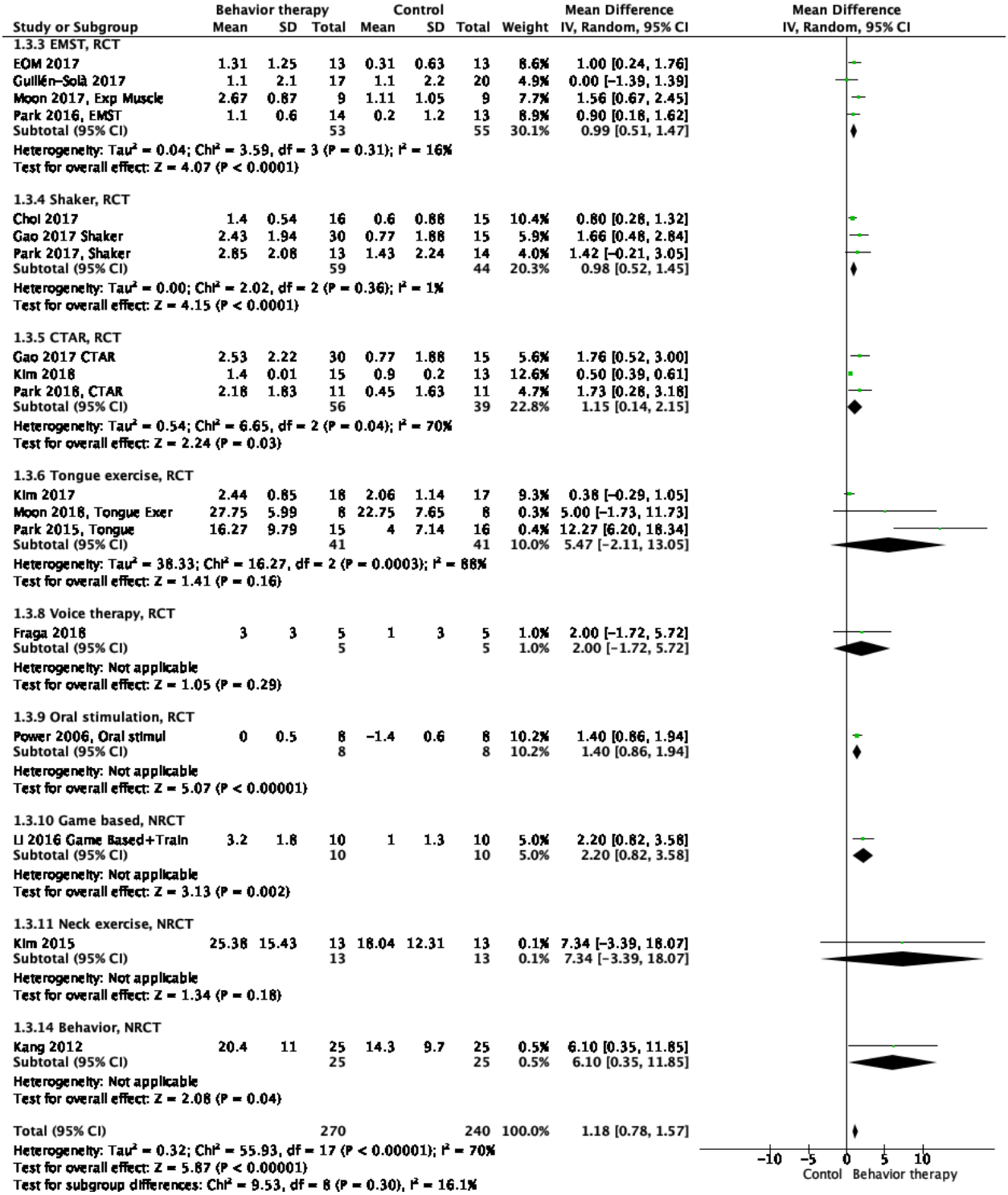


Figure 3: Dysphagia scores after different behavior therapies in patients with dysphagia after stroke

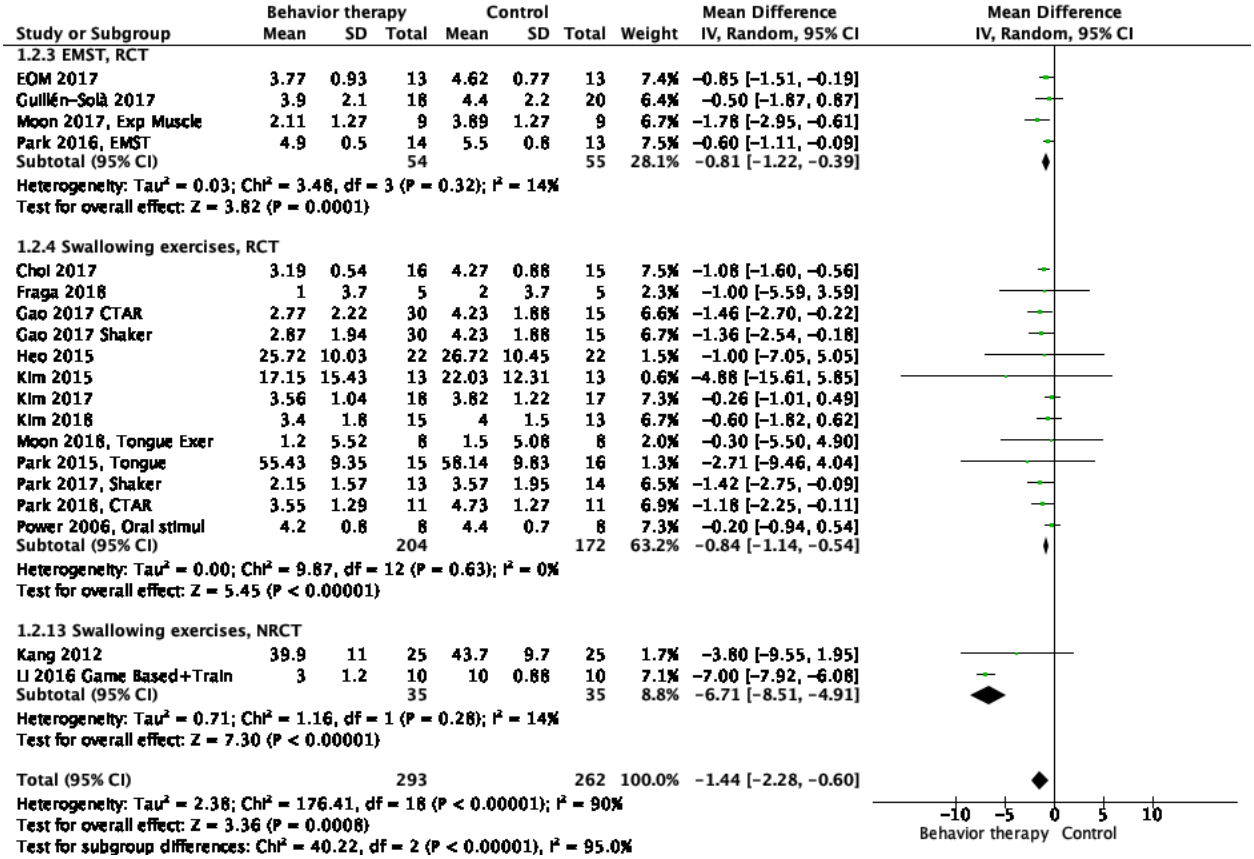


Figure 4: Dysphagia scores after different kinds of behavior therapies in patients with dysphagia after stroke

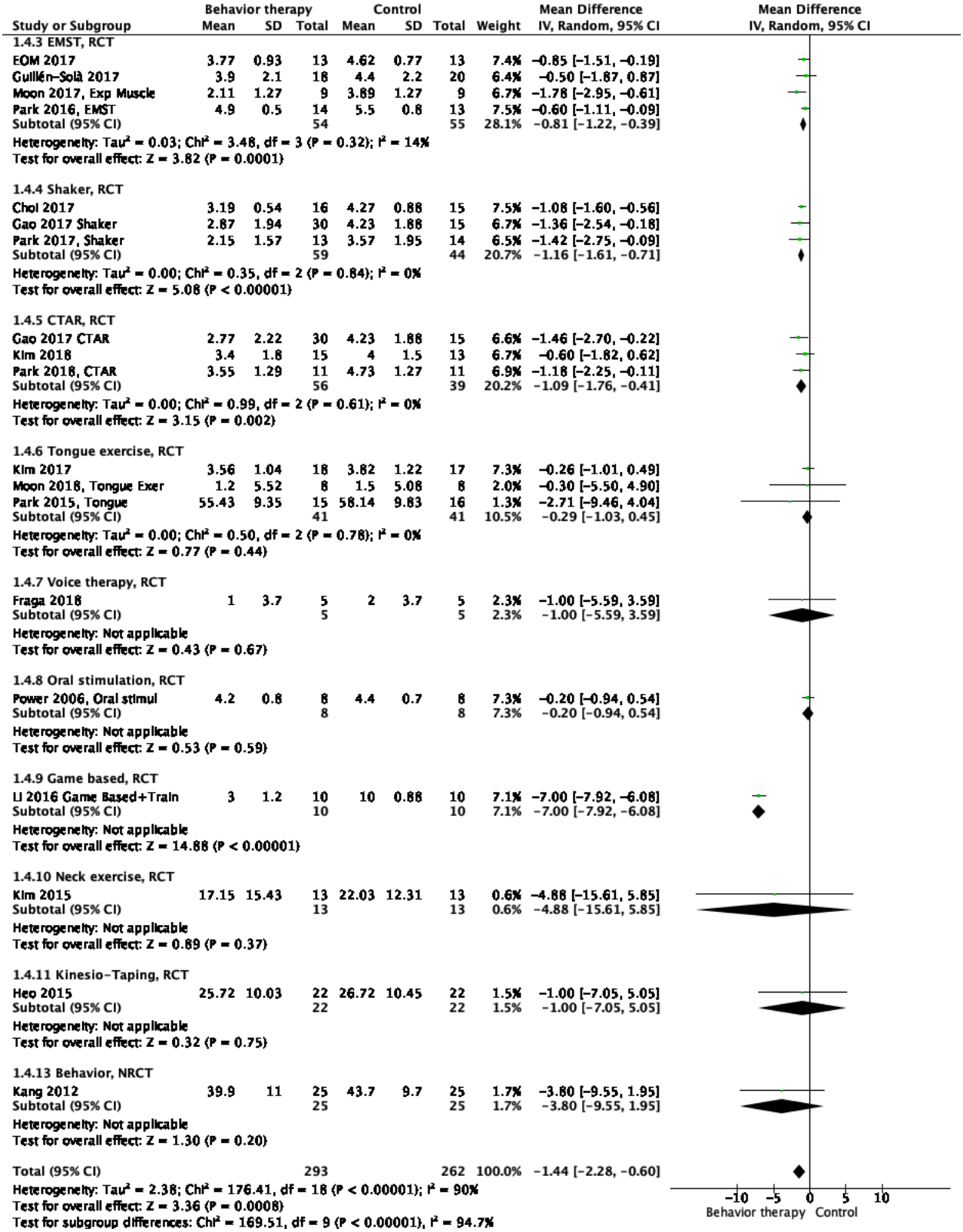


Table 2: Effect of behavior therapy on different types of dysphagia scores in patients with dysphagia after stroke

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Behavior	Control				
PAS-Change						
• RCT	-1.9±1.4	-0.8±1.4	12(358)	-0.98 [-1.30, -0.65]	62%	<0.00001
PAS-Post intervention						
• RCT	3.3±1.5	4.3±1.4	12(358)	-0.82 [-1.08, -0.57]	12%	<0.00001
VDS-Change						
• Overall	-10.9±5.7	-7.1±4.9	8(260)	-4.24 [-6.09, -2.38]	76%	<0.00001
• RCT	-8.9±4.6	-5.0±3.5	7(210)	-4.08 [-6.01, -2.16]	79%	<0.0001
• NRCT	-20.4±11.0	-14.3±9.7	1(50)	-6.10 [-11.85, -0.35]	NA	0.004
VDS-Post intervention						
• Overall	31.8±9.4	43.2±8.0	8(241)	-5.31 [-8.20, -2.42]	82%	0.0003
• RCT	29.9±9.0	43.1±7.5	7(191)	-5.60 [-8.75, -2.45]	85%	0.005
• NRCT	39.9±11.0	43.7±9.7	1(50)	-3.80 [-9.55, 1.95]	NA	0.20
FDS-Change						
• RCT	-13.3±6.6	-5.8±5.8	2(40)	-6.37 [-12.05, -0.70]	56%	0.03
FDS-Post intervention						
• RCT	23.3±9.5	25.8±10.5	3(84)	-2.72 [-6.49, 1.05]	0%	0.16
FOIS-Change						
• Overall	2.4±1.5	0.8±1.3	5(138)	1.58 [1.15, 2.00]	0%	<0.00001
• RCT	1.9±1.7	0.6±1.4	3(68)	1.19 [0.55, 1.84]	0%	0.0003
• NRCT	2.9±1.2	1.0±1.2	2(70)	1.87 [1.31, 2.43]	0%	<0.00001
FOIS-Post intervention						
• Overall	5.0±1.4	3.8±1.4	5(138)	1.20 [0.70, 1.70]	20%	<0.0001
• RCT	5.3±1.7	4.3±1.4	3(68)	1.01 [0.39, 1.63]	0%	0.001
• NRCT	4.7±1.1	3.3±1.4	2(70)	1.69 [0.13, 3.24]	78%	0.03
MASA-Change						
• RCT	27.8±6.0	22.8±7.7	1(16)	5.00 [-1.73, 11.73]	NA	0.15
MASA-Post intervention						
• RCT	173.3±5.5	166.9±5.1	1(16)	6.37 [1.17, 11.57]	NA	0.02
ASHA-Change						
• RCT	2.3±4.5	2.8±1.4	1(26)	-0.53 [-3.09, 2.03]	NA	0.69
ASHA-Post intervention						
• RCT	4.5±4.5	4.8±1.4	1(26)	-0.38 [-2.94, 2.18]	NA	0.77

CI: Confidence intervals; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; NRCT: Non-randomized controlled trial; p: Statistical significance value; SD: Standard Deviation; MD: Mean Difference; RCT: Randomized controlled trial

Figure 5: Effect of behavior therapy on PAS scores in patients with dysphagia after stroke

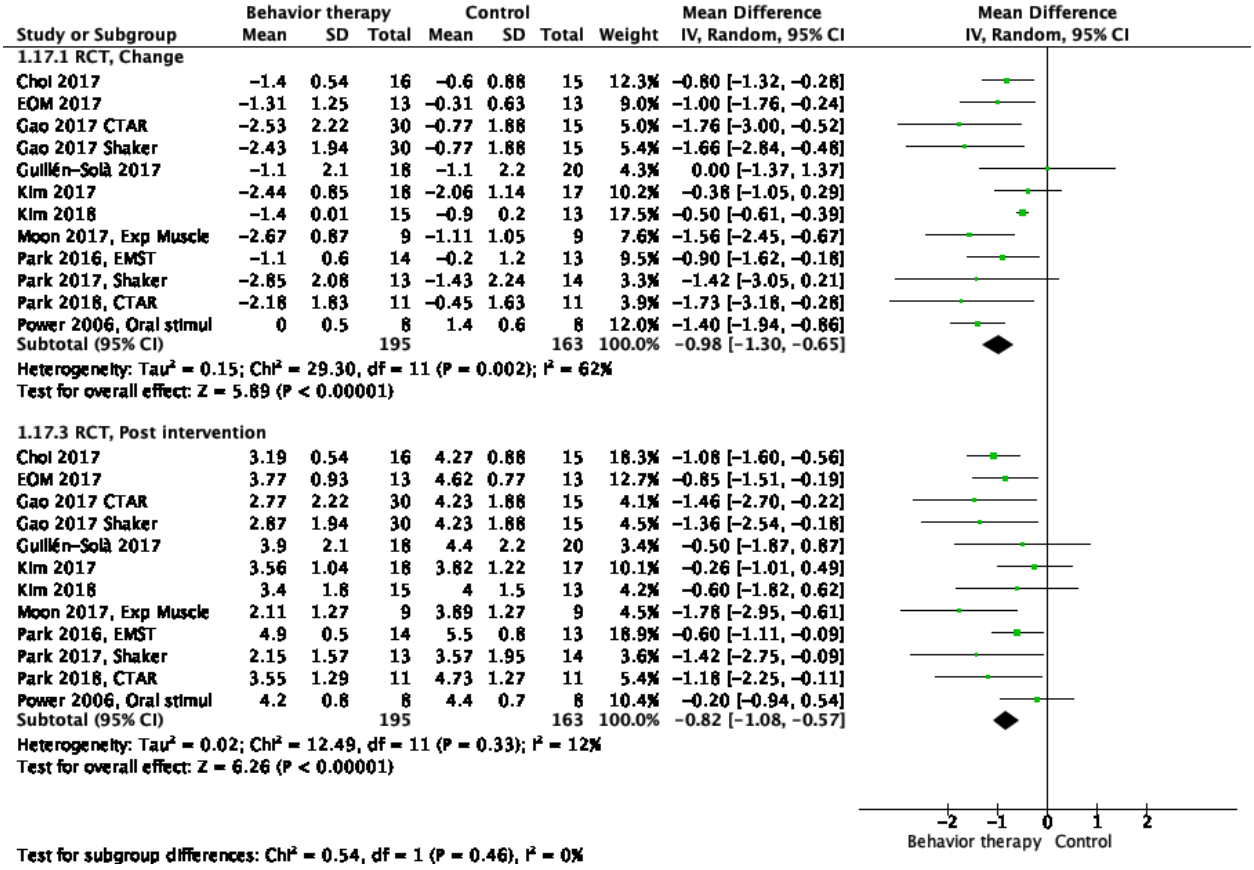


Figure 6: Effect of behavior therapy on VDS scores in patients with dysphagia after stroke

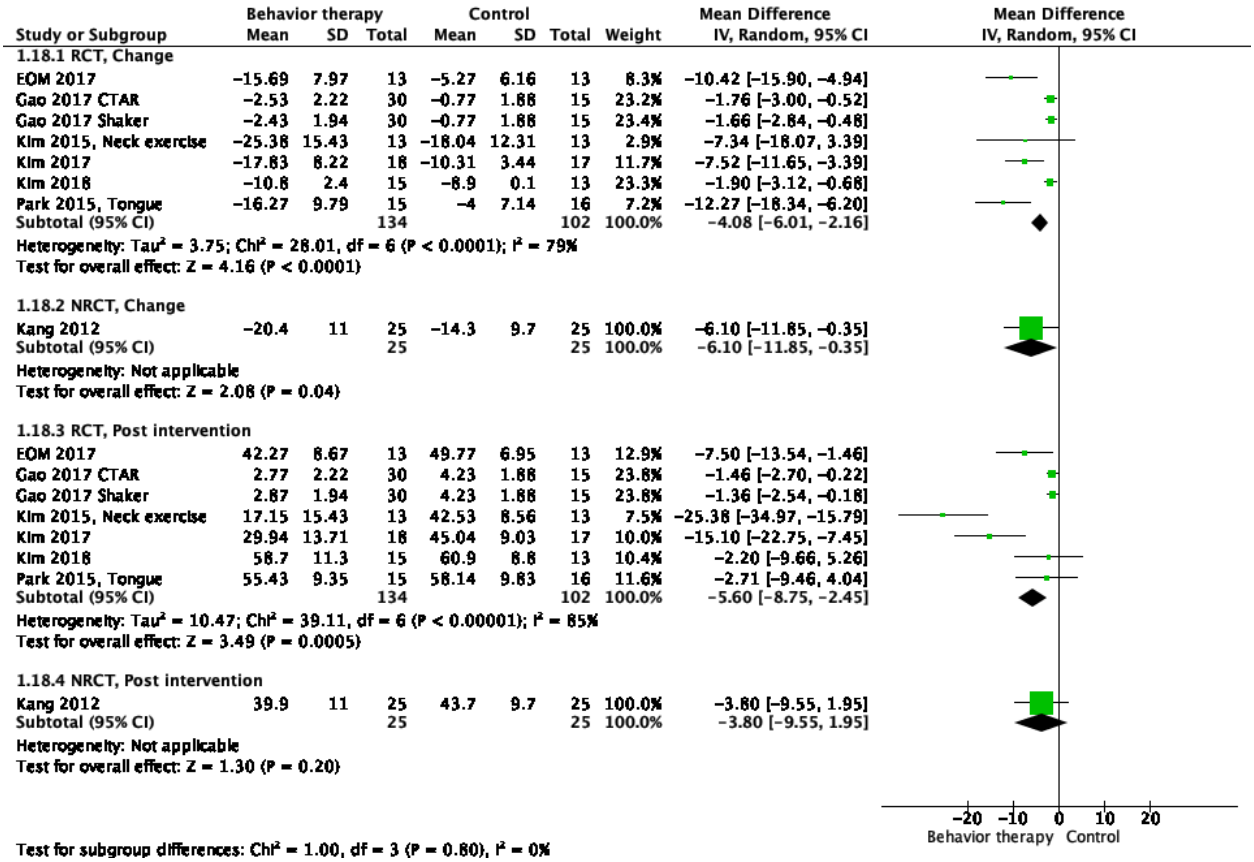


Figure 7: Effect of behavior therapy on FDS scores in patients with dysphagia after stroke

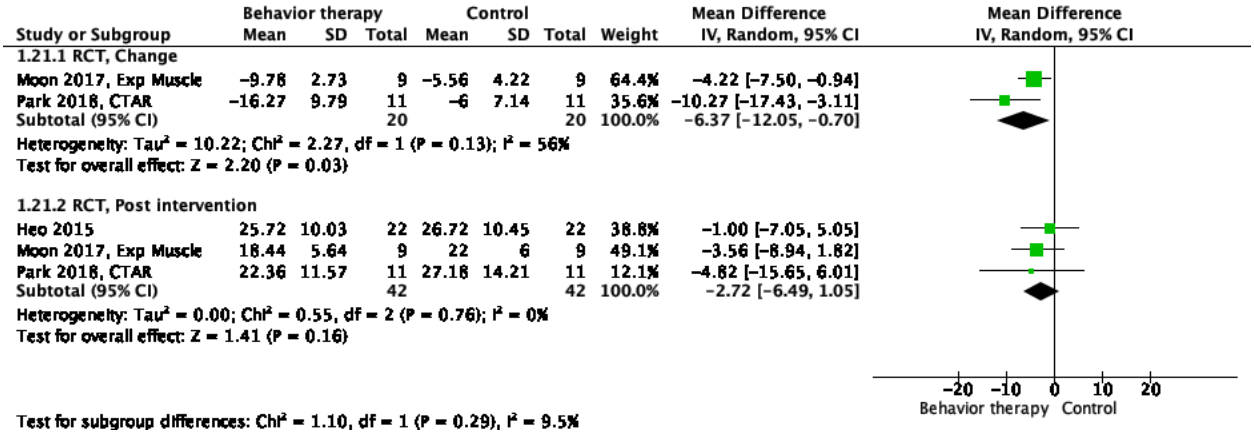


Figure 8: Effect of behavior therapy on FOIS scores in patients with dysphagia after stroke

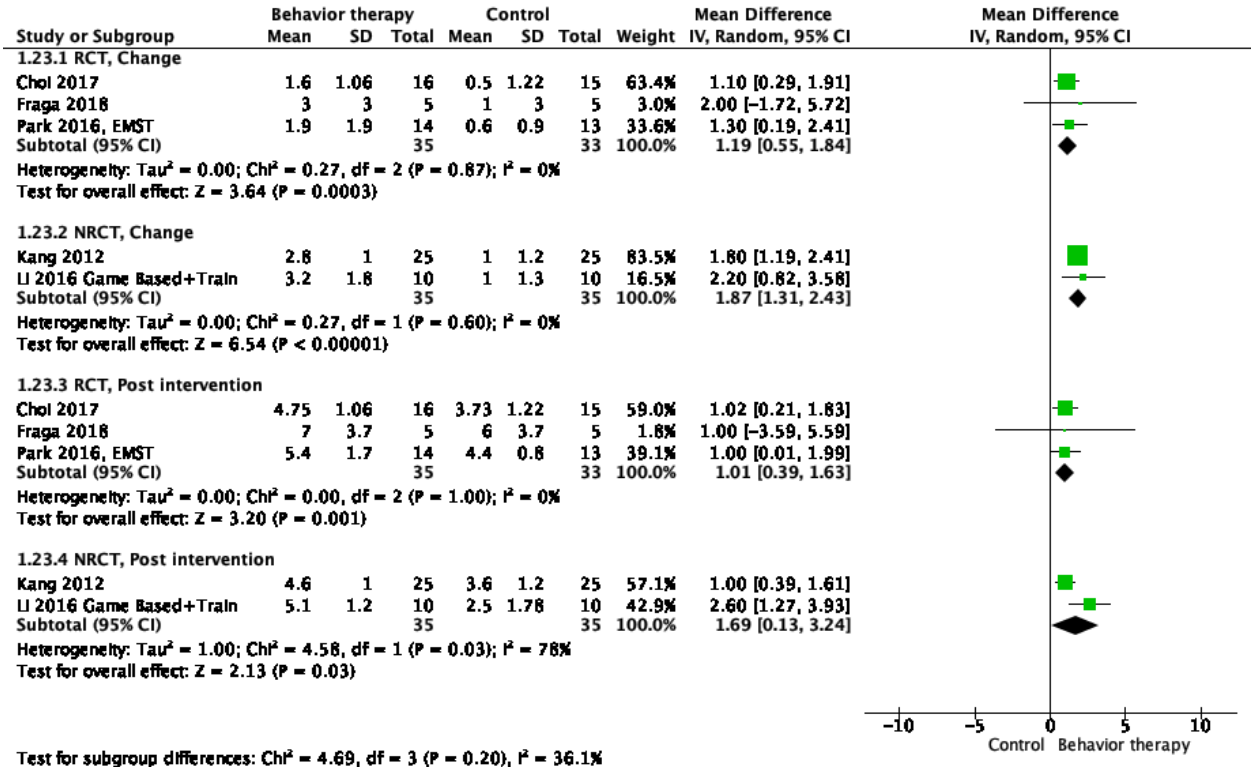


Figure 9: Effect of behavior therapy on MASA scores in patients with dysphagia after stroke

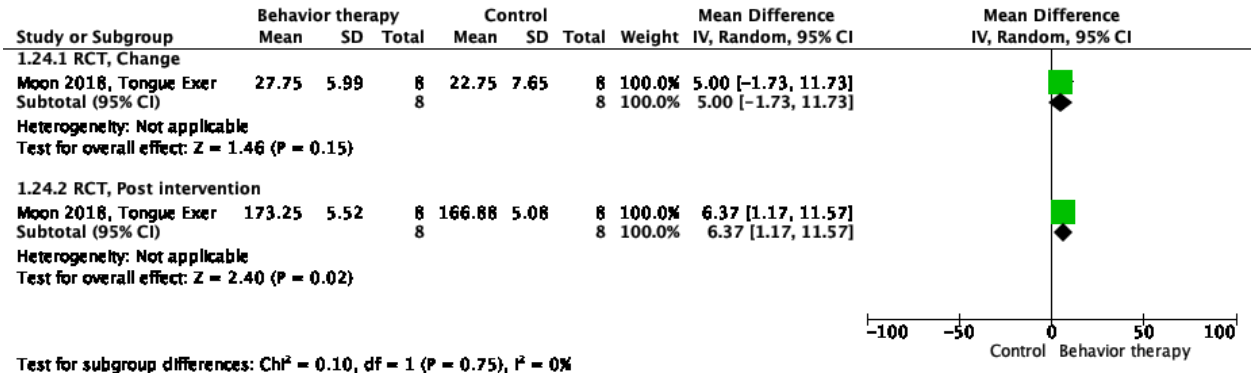


Figure 10: Effect of behavior therapy on ASHA scores in patients with dysphagia after stroke

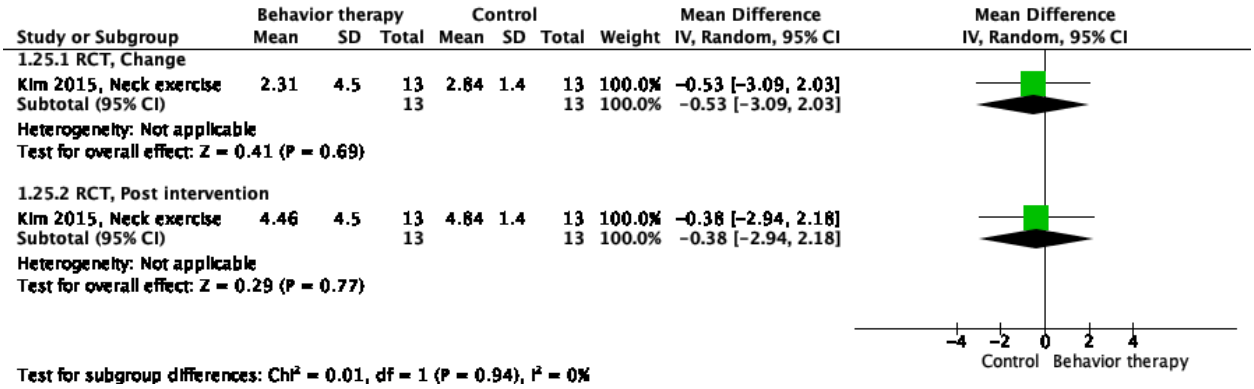


Table 3: Effect of behaviour therapy on different outcomes in patients with dysphagia after stroke

Outcome	Mean±SD/ Incidence (%)		n (N)	MD/ RR [95% CI]	I^2	P value
	Behavior	Control				
Mortality						
• RCT	15.1%	10.7%	3(505)	1.47 [0.32, 6.78]	71%	0.62
mRS, RCT						
• mRS ≥3	50.5%	48.0%	1(306)	1.05 [0.82, 1.34]	NA	0.69
Pneumonia						
• Overall	18.4%	24.5%	6(677)	0.57 [0.43, 0.75]	0%	< 0.0001
• EMST, RCT	11.6%	19.0%	3(196)	0.58 [0.24, 1.41]	22%	0.23
• Swallowing exercises, RCT	21.3%	26.6%	3(481)	0.56 [0.41, 0.76]	0%	0.0002
LOS						
• Swallowing exercise, RCT	19.2±1.2	21.4±12.4	1(306)	-2.20 [-4.61, 0.21]	NA	0.07
Tubing						
• Tube removal	63.6%	28.6%	2(43)	2.16 [0.75, 6.17]	43%	0.15

CI: Confidence intervals; I^2, p: Heterogeneity; LOS: Length of Stay; MD: Mean differnence; n: Number of studies; N: Number of patients; NA: Not applicable; NRCT: Non-randomized controlled trial; p: Statistical significance value; RCT: Randomized controlled trial; RR: Risk Ratio; SD: Standard deviation

Figure 11: Effect of behavior therapy on Mortality scores in patients with dysphagia after stroke

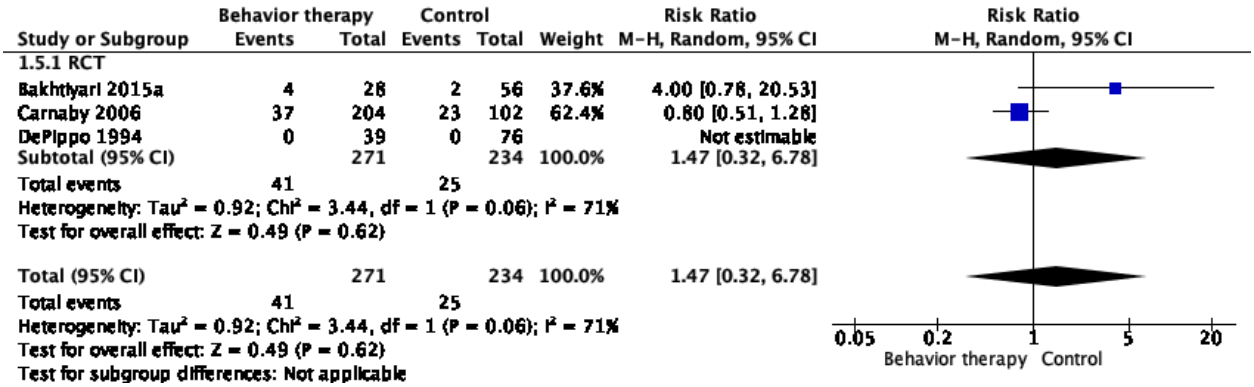


Figure 12: Effect of behavior therapy on mRS scores in patients with dysphagia after stroke

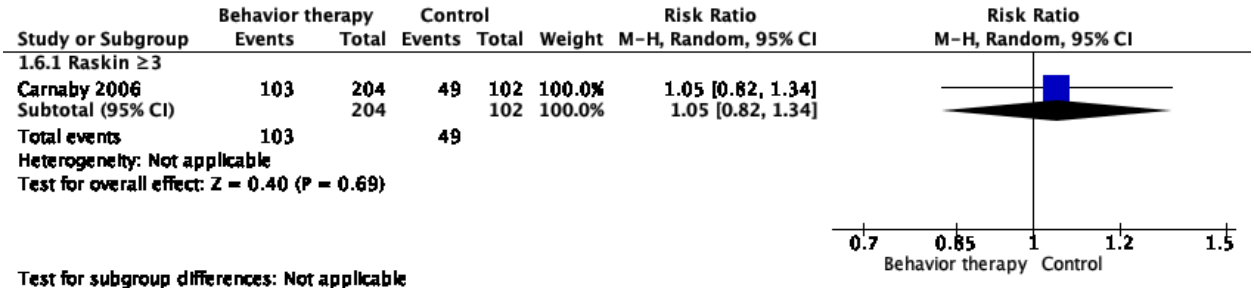


Figure 13: Effect of behavior therapy on Pneumonia scores in patients with dysphagia after stroke

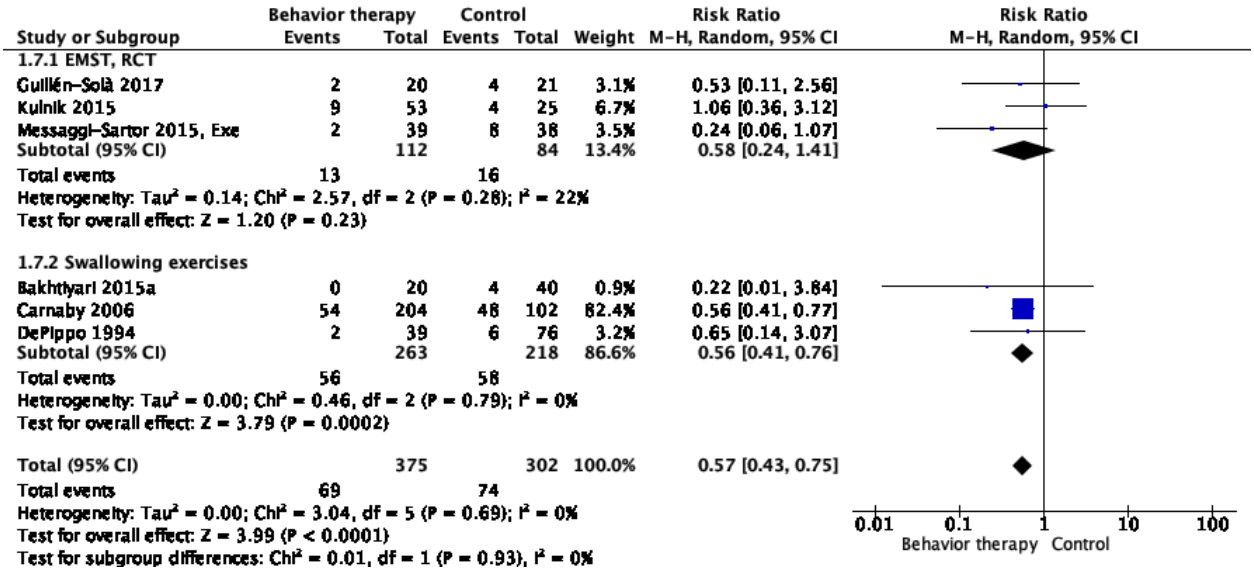


Figure 14: Effect of behavior therapy on Length of study, days scores in patients with dysphagia after stroke

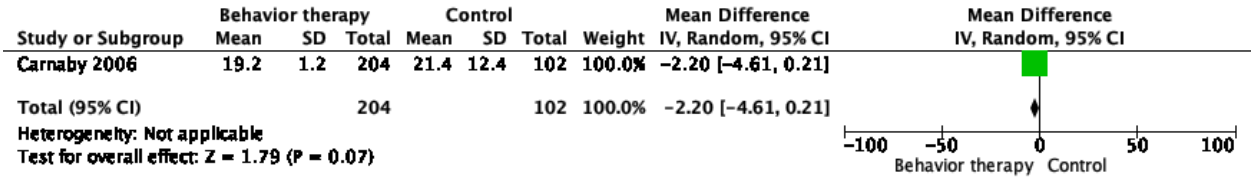


Figure 15: Effect of behavior therapy on tube removal scores in patients with dysphagia after stroke

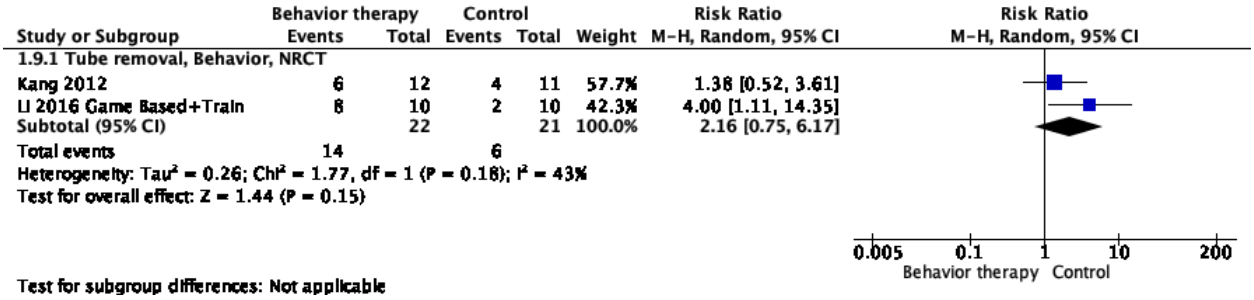


Table 4: Effect of behaviour therapy on different outcomes in patients with dysphagia after stroke

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Behavior	Control				
QoL-Change						
• Overall	25.8±13.1	18.5±7.0	2(66)	0.68 [0.18, 1.17]	0%	0.008
• RCT	36.9±13.3	30.4±7.1	1(16)	0.58 [-0.43, 1.58]	NA	0.26
• NRCT	22.2±13.0	14.7±7.0	1(50)	0.71 [0.13, 1.28]	NA	0.02
QoL-Post intervention						
• Overall	151.8±18.6	148.1±21.0	2(66)	0.25 [-0.24, 0.74]	0%	0.31
• RCT	164.5±5.3	159.3±9.5	1(16)	0.64 [-0.37, 1.66]	NA	0.21
• NRCT	147±22.9	144.5±24.7	1(50)	0.13 [-0.42, 0.69]	NA	0.64
Depression scale-Change						
Overall	-5.3±4.9	-0.7±5.5	3(140)	-0.84 [-1.20, -0.48]	0%	<0.00001
RCT	-5.6±4.4	-0.7±6.6	2(90)	-0.90 [-1.37, -0.44]	1%	0.0001
NRCT	-4.7±6.0	-0.8±4.2	1(50)	-0.74 [-1.32, -0.17]	NA	0.01
Depression scale-Post intervention						
• Overall	38.7±4.9	39.6±5.5	3(140)	-0.69 [-1.06, -0.32]	8%	0.0002
• RCT	43.6±4.4	48.2±6.6	2(90)	-0.85 [-1.32, -0.38]	4%	0.0004
• NRCT	26.8±6.0	29.2±4.2	1(50)	-0.46 [-1.02, 0.11]	NA	0.11
Functional independence measure-Change						
• NRCT	5.8±7.5	5.2±9.9	1(50)	0.60 [-4.27, 5.47]	NA	0.81
Functional independence measure-Post intervention						
• NRCT	74.2±7.5	72.9±9.9	1(50)	1.30 [-3.57, 6.17]	NA	0.60

CI: Confidence intervals; ICU: Intensive care unit; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; NRCT: Non-randomized controlled trial; p: Statistical significance value; QoL: Quality of life; SD: Standard Deviation; MD: Mean Difference; RCT: Randomized controlled trial

Figure 16: Effect of behaviour therapy on QoL scores in patients with dysphagia after stroke

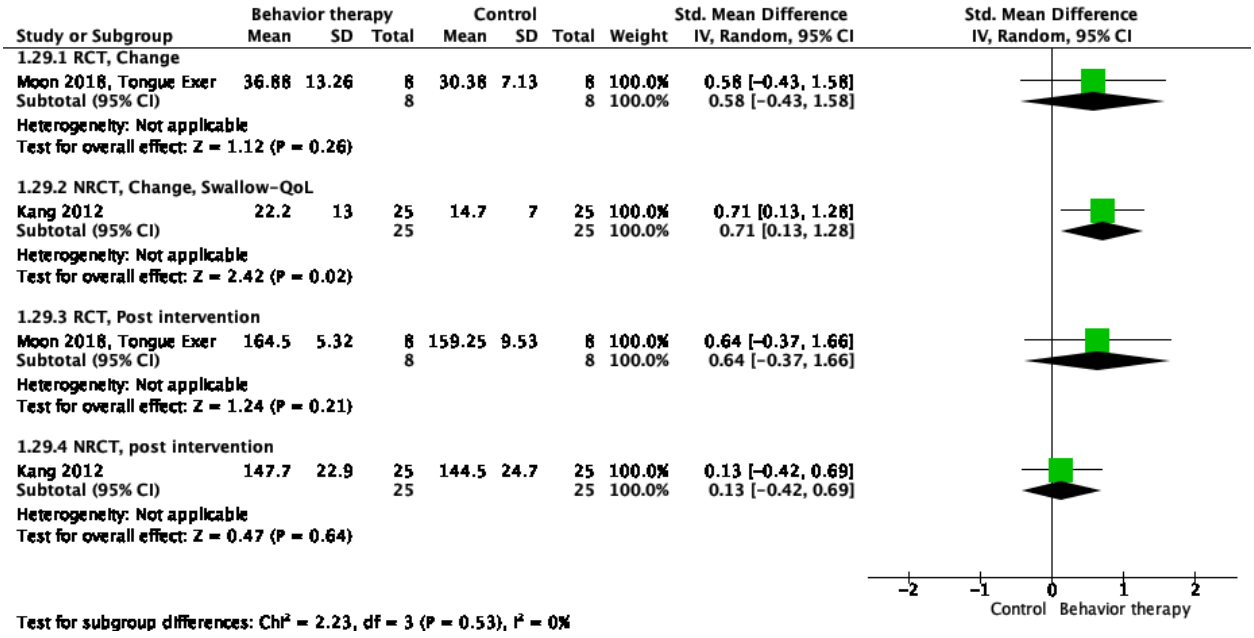


Figure 17: Effect of behavior therapy on Depression scores in patients with dysphagia after stroke

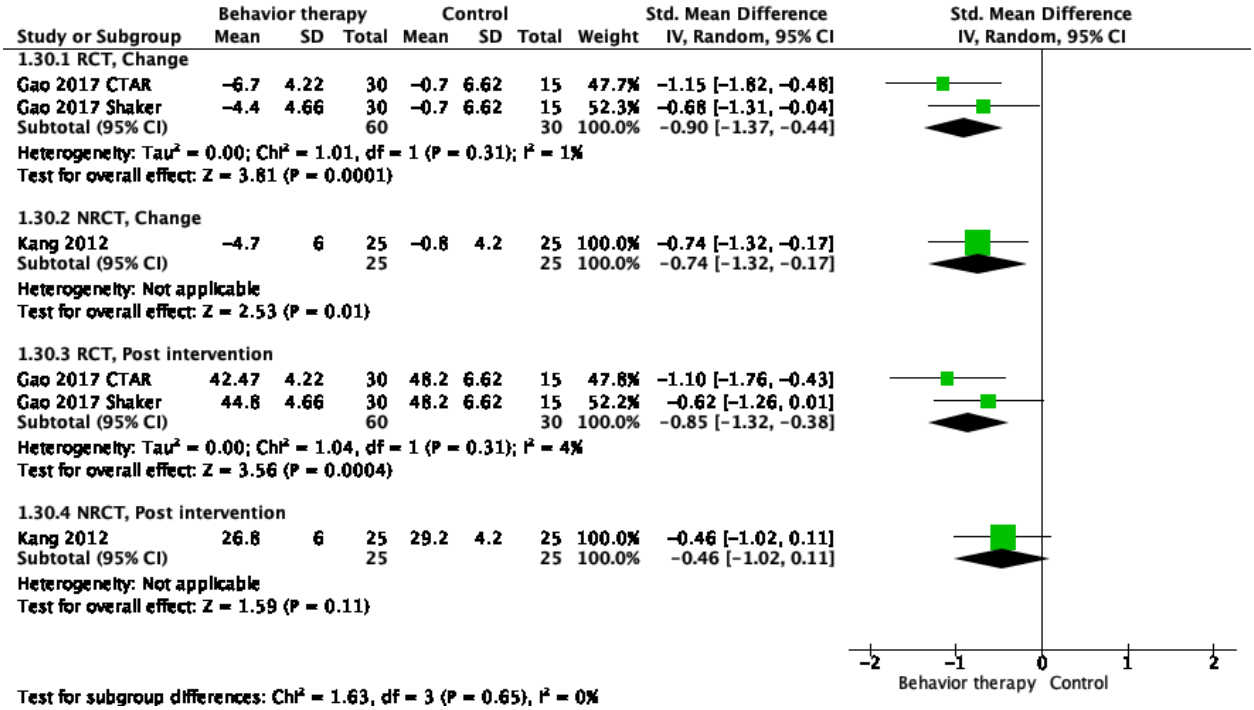


Figure 18: Effect of behaviour therapy on Functional independence measure scores in patients with dysphagia after stroke

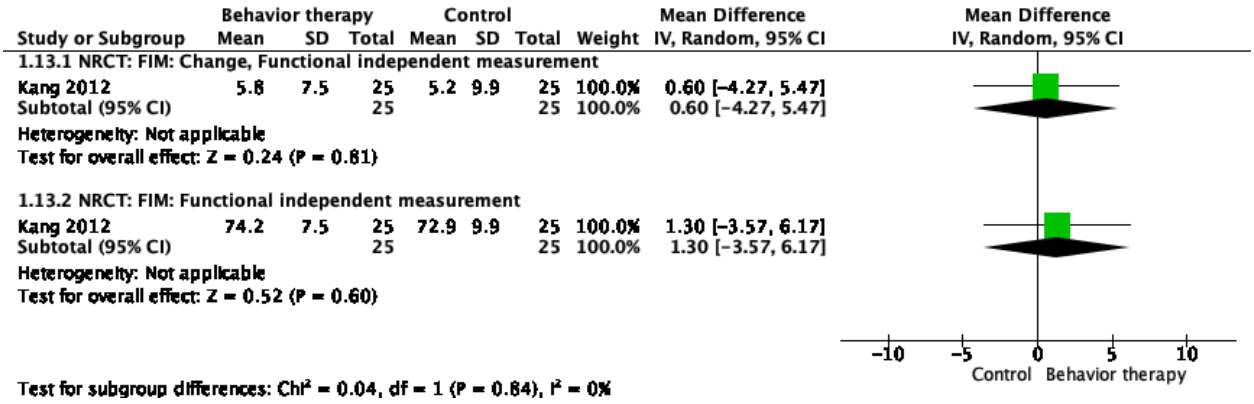


Table 5: Effect of behaviour therapy on different outcomes in patients with dysphagia after stroke

Outcome	Incidence (%)		n (N)	RR [95% CI]	I^2	P value
	Behavior	Control				
Efficacy parameters						
Dysphagia at end	40.1%	57.5%	5(537)	0.72 [0.61, 0.86]	21%	0.0002
Recovery, RCT	41.3%	18.9%	3(178)	2.29 [1.38, 3.82]	0%	0.001
Total effective rate, RCT	81.7%	40.0%	2(90)	2.04 [1.30, 3.22]	0%	0.04
Normal diet, RCT	66.7%	55.9%	1(306)	1.19 [0.98, 1.45]	NA	0.08
Functional swallowing, RCT	45.6%	32.4%	1(306)	1.41 [1.03, 1.94]	NA	0.03
Adverse effects in RCTs						
• Stroke, RCT	3.7%	6.4%	1(101)	0.58 [0.10, 3.33]	NA	0.54
• Pulmonary thromboembolism, RCT	0.0%	2.1%	1(101)	0.29 [0.01, 6.98]	NA	0.45
• Airway obstruction, RCT	0%	1%	1(115)	0.64 [0.03, 15.40]	NA	0.78
• Depression, RCT	13.3%	33.3%	1(90)	0.41 [0.18, 0.93]	0%	0.03
• Dehydration, RCT	36.3%	47.0%	1(437)	0.57 [0.27, 1.20]	NA	0.7
• Hip fracture, RCT	1.9%	2.1%	1(101)	0.87 [0.06, 13.53]	NA	0.92
• Complications, RCT	36.3%	47.0%	3(437)	0.57 [0.27, 1.20]	62%	0.14
• Institutionalization	17.6%	25.5%	1(306)	0.69 [0.44, 1.08]	NA	0.11

CI: Confidence intervals; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RR: Risk Ratio

Figure 19: Effect of behavior therapy on Efficacy scores in patients with dysphagia after stroke

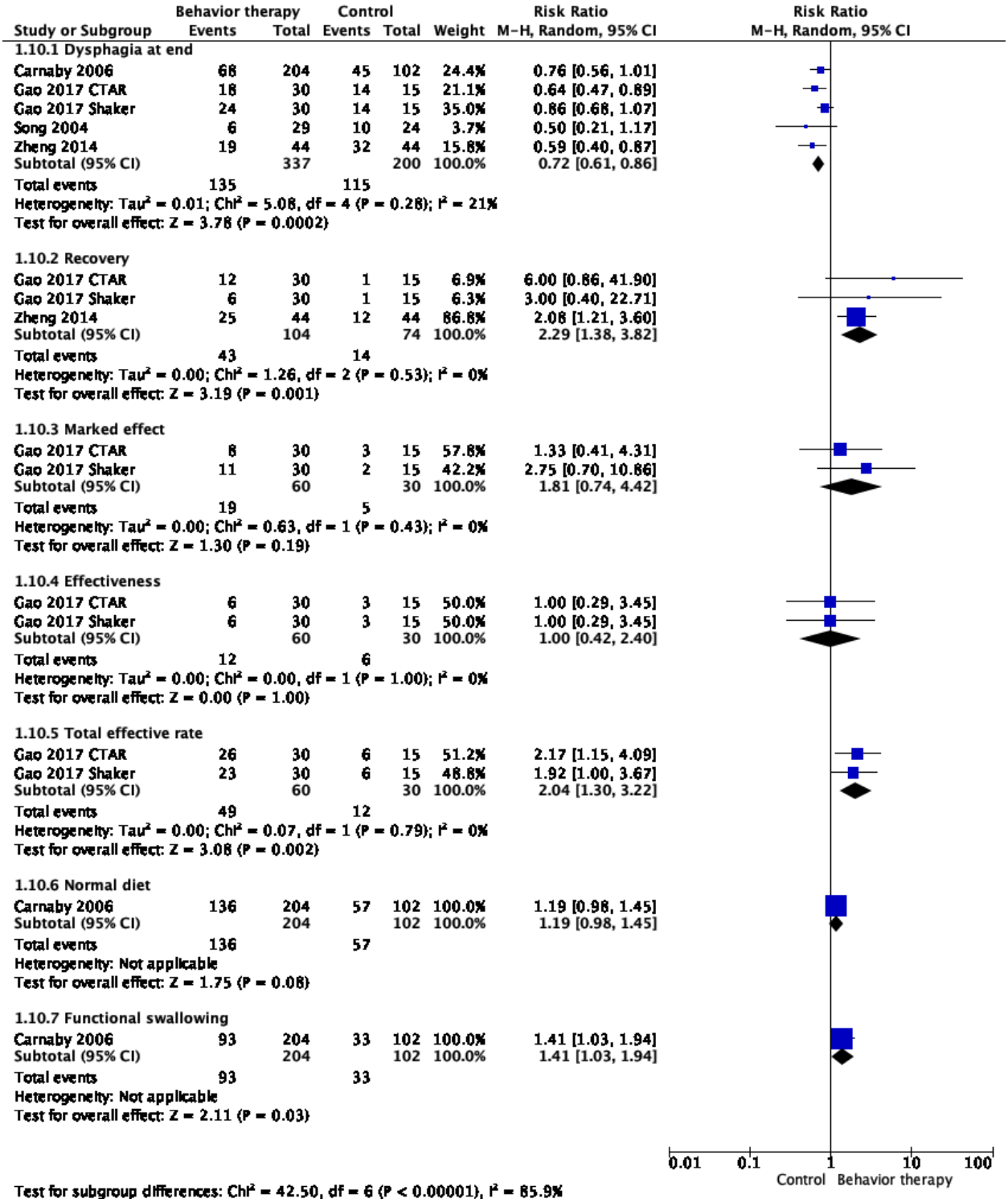


Figure 20: Effect of behaviour therapy on Adverse effects scores in patients with dysphagia after stroke

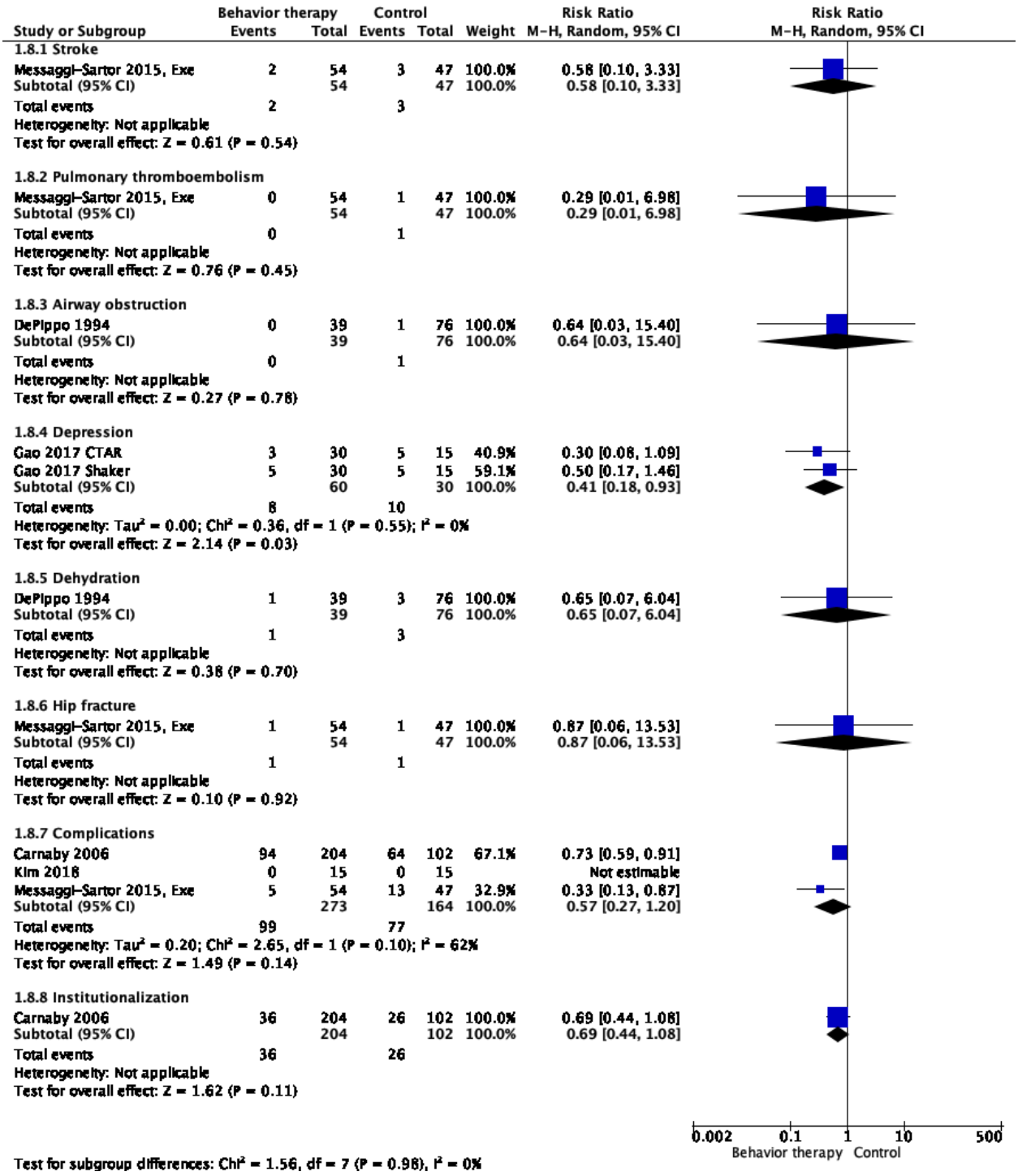


Table 6: Effect of behaviour therapy (tongue exercises) on tongue pressure in patients with dysphagia after stroke

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Behavior	Control				
Tongue pressures, RCT						
Anterior pressure, RCT						
• Change	7.6±5.7	1.7±4.7	2(47)	8.08 [-5.83, 21.98]	96%	0.25
• Post intervention	35.7±7.6	29.3±7.6	3(82)	7.00 [-3.56, 17.56]	91%	0.19
Posterior pressure, RCT						
• Change	18.8±5.4	12.1±6.3	3(58)	8.73 [-6.50, 23.96]	97%	0.26
• Post intervention	35.0±6.7	25.8±6.9	4(93)	11.42 [1.06, 21.78]	94%	0.03

CI: Confidence intervals; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; SD: Standard Deviation; MD: Mean Difference

Figure 21: Effect of tongue exercises on tongue pressures scores in patients with dysphagia after stroke

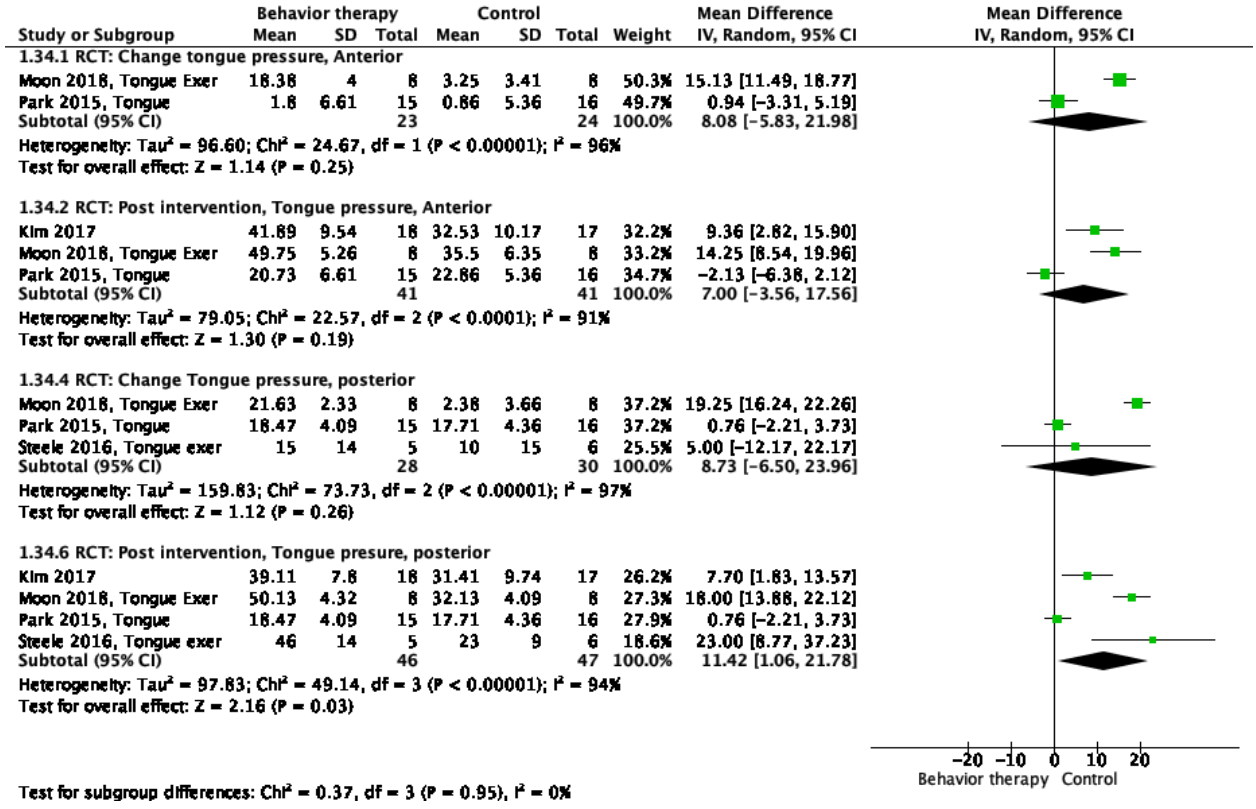


Table 7: Effect of behaviour therapy on pharyngeal outcomes in patients with dysphagia after stroke

Outcome	Mean±SD/ %		n (N)	MD/ RR [95% CI]	I^2	P value
	Behavior	Control				
Pharyngeal outcomes						
Swallowing exercises						
Pharyngeal residue, Vallecular, RCT						
• Change, RCT	22.2%	13.9%	1(72)	1.60 [0.58, 4.43]	NA	0.37
• Post intervention, RCT	44.4%	47.2%	1(72)	0.94 [0.57, 1.56]	NA	0.81
Pharyngeal residue, Piriform sinus, RCT						
• Change, RCT	38.9%	16.7%	1(72)	2.33 [1.01, 5.39]	NA	0.05
• Post intervention-RCT	27.8%	61.1%	1(72)	0.45 [0.25, 0.82]	NA	0.009
Pharyngeal remnant						
• Change, RCT	-20.9±8.1	-10.4±1.6	1(28)	-10.50 [-14.69, -6.31]	NA	< 0.00001
• Post intervention, RCT	22.4±13.3	33.8±11.6	1(28)	-11.40 [-20.62, -2.18]	NA	0.02
With EMST						
Vesicular residue						
• Change, RCT	-1.1±0.3	-0.6±0.5	1(18)	-0.55 [-0.96, -0.14]	NA	0.008
• Post intervention, RCT	0.3±0.5	1.1±0.6	1(18)	-0.78 [-1.29, -0.27]	NA	0.003
Piriform sinus residue						
• Change, RCT	-0.6±0.5	-0.2±0.4	1(18)	-0.34 [-0.79, 0.11]	NA	0.14
• Post intervention, RCT	0.6±0.5	0.9±0.6	1(18)	-0.33 [-0.85, 0.19]	NA	0.22

CI: Confidence intervals; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; SD: Standard Deviation; MD: Mean Difference; RR: Risk Ratio

Fig 22: Effect of behaviour therapy on Pharyngeal outcomes scores in patients with dysphagia after stroke

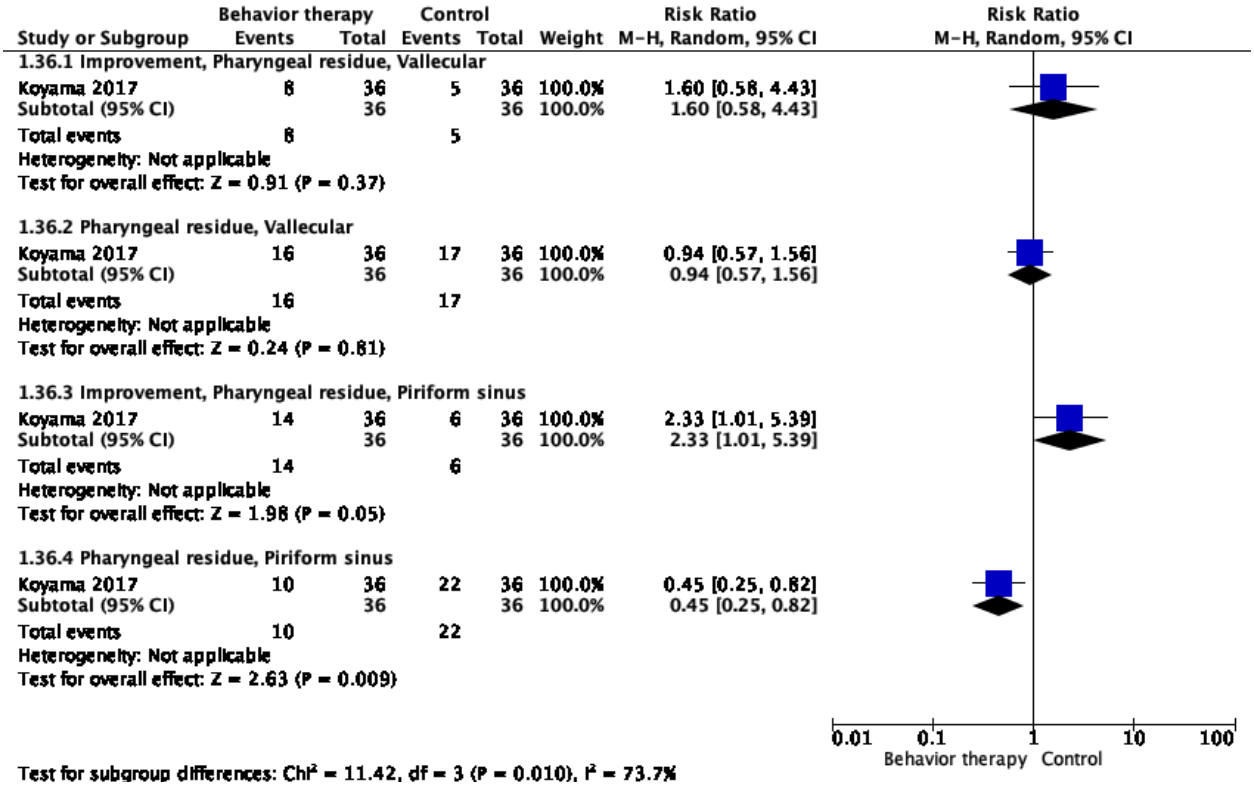


Fig 23: Effect of behaviour therapy on pharyngeal outcomes scores in patients with dysphagia after stroke

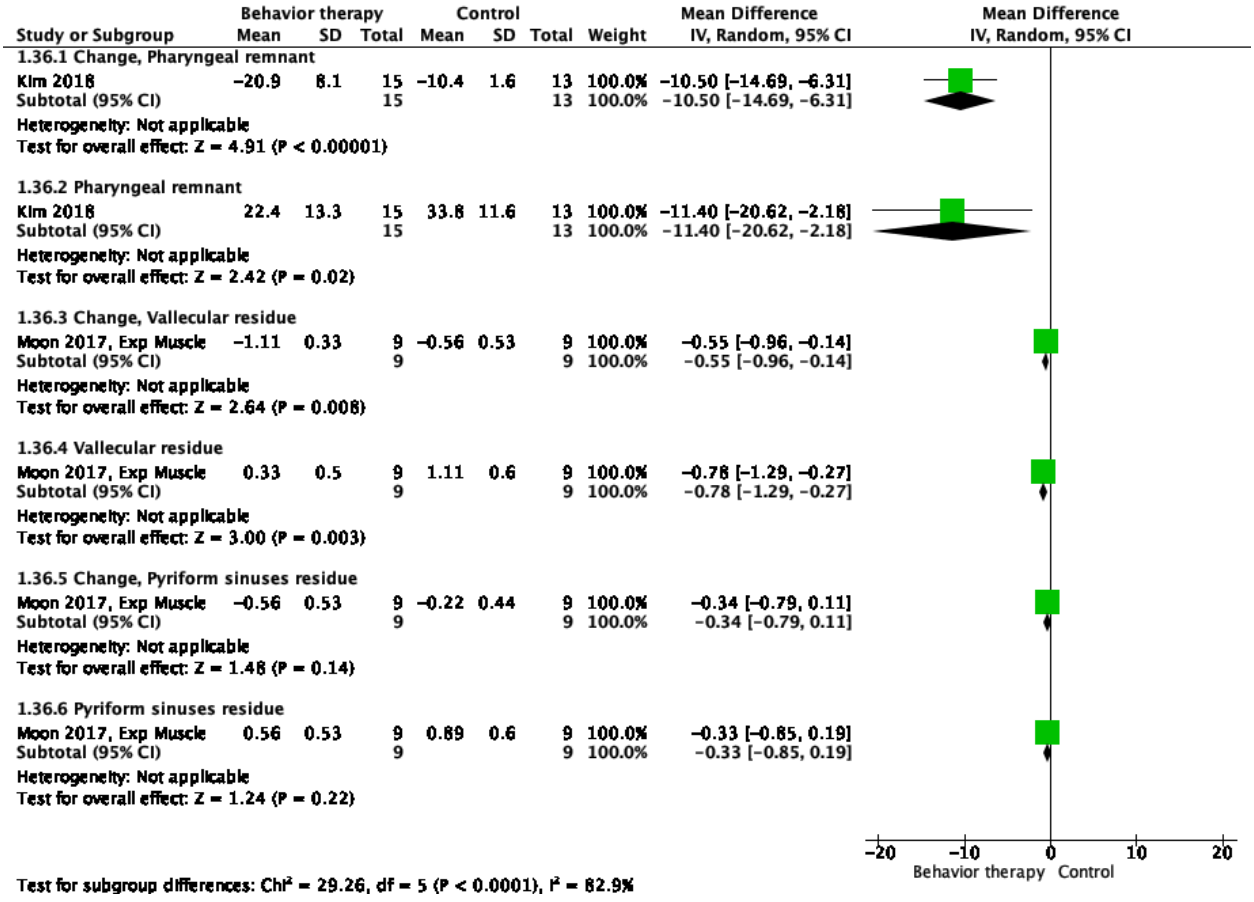


Table 8: Effect of behaviour therapy on pharyngeal timings in patients with dysphagia after stroke

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Behavior	Control				
Pharyngeal transit time						
• RCT	3.5±1.3	3.9±2.3	2(44)	-0.19 [-0.24, -0.14]	0%	< 0.0001
Swallow response time						
• RCT	0.8±0.3	0.6±0.2	1(16)	0.27 [-0.00, 0.54]	NA	0.05
Oral transit time						
• RCT	0.4±0.0	0.4±0.1	1(16)	-0.02 [-0.08, 0.04]	NA	0.53
Laryngeal closure time						
• RCT	0.8±0.1	0.9±0.2	1(16)	-0.16 [-0.29, -0.03]	NA	0.02
Cricopharyngeal opening duration						
• RCT	0.6±0.2	0.6±0.0	1(16)	-0.04 [-0.18, 0.10]	NA	0.57
Duration of stage transition						
• RCT	0.9±1.2	1.3±1.5	1(20)	-0.36 [-1.55, 0.83]	NA	0.55
Total swallow duration						
• RCT	2.4±1.3	3.0±1.6	1(20)	-0.52 [-1.77, 0.73]	NA	0.42

CI: Confidence intervals; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; SD: Standard Deviation; MD: Mean Difference

Figure 24: Effect of behaviour therapy on Pharyngeal timings scores in patients with dysphagia after stroke

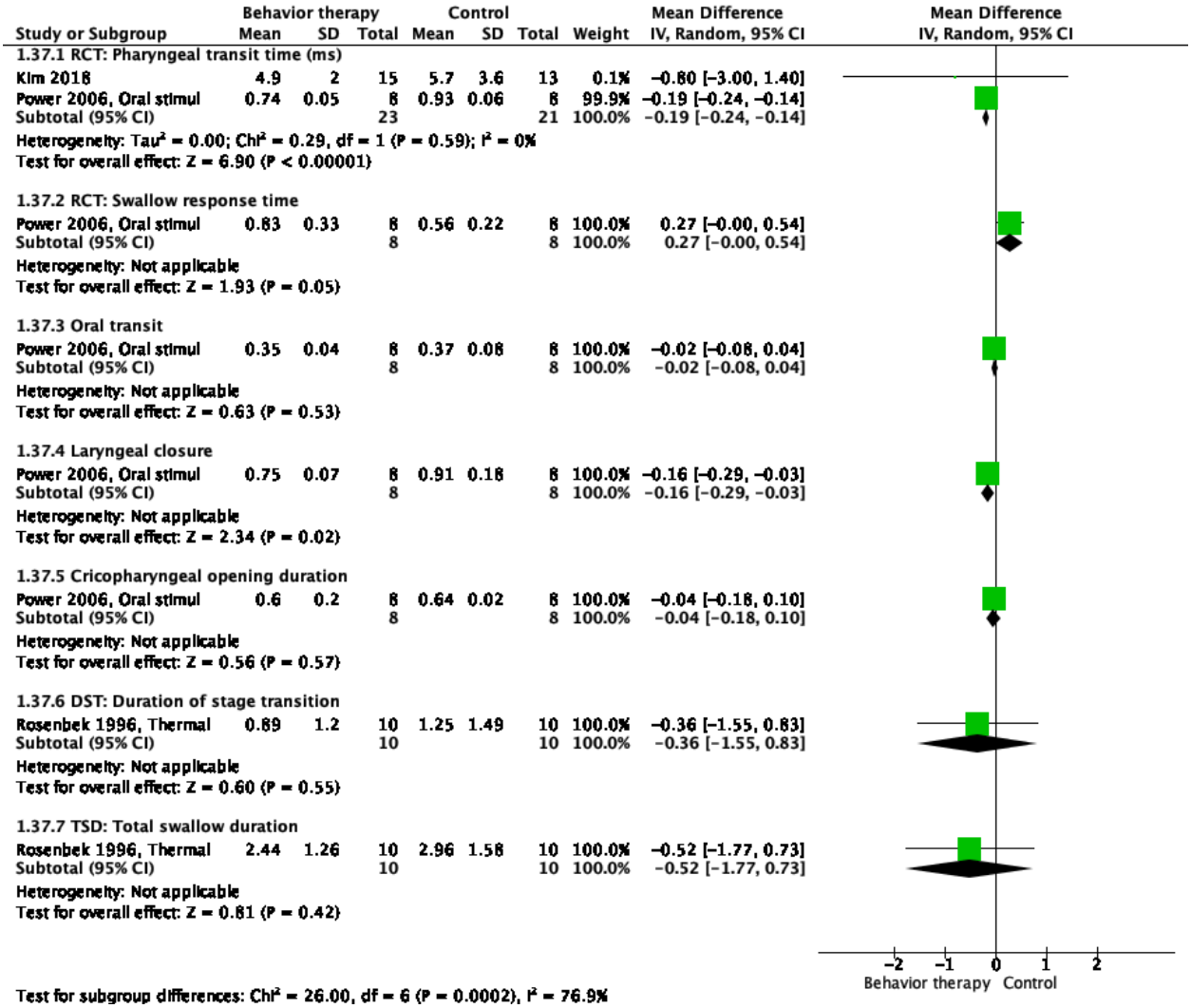


Table 9: Effect of behaviour therapy on hyoid bone, laryngeal and epiglottis movements in patients with dysphagia after stroke

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Behavior	Control				
Larynx						
Larynx, horizontal displacement						
• RCT	0.9±0.4	0.9±0.5	1(27)	0.01 [-0.31, 0.33]	NA	0.95
Larynx, vertical displacement						
• RCT	2.1±0.7	2.2±0.6	1(27)	-0.02 [-0.49, 0.45]	NA	0.93
Hyoid bone						
Horizontal excursion (cm)						
• RCT	1.9±0.6	1.7±0.5	1(71)	0.13 [-0.12, 0.37]	0%	0.31
Horizontal excursion (cm)						
• RCT	2.3±0.7	1.9±0.6	1(71)	0.41 [0.12, 0.70]	0%	0.05
Superior displacement						
• RCT	1.7±0.6	1.2±0.3	1(12)	0.46 [-0.02, 0.94]	NA	0.06
Anterior displacement						
• RCT	1.4±0.2	1.3±0.3	1(12)	0.06 [-0.21, 0.33]	NA	0.66
Epiglottis						
Rotation						
• RCT	51.0±17.8	41.0±20.2	1(24)	10.00 [-1.24, 21.24]	NA	0.08

CI: Confidence intervals; ICU: Intensive care unit; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; SD: Standard Deviation; MD: Mean Difference

Fig 25: Effect of behaviour therapy on Hyoid bone, larynx and epiglottis movements scores in patients with dysphagia after stroke

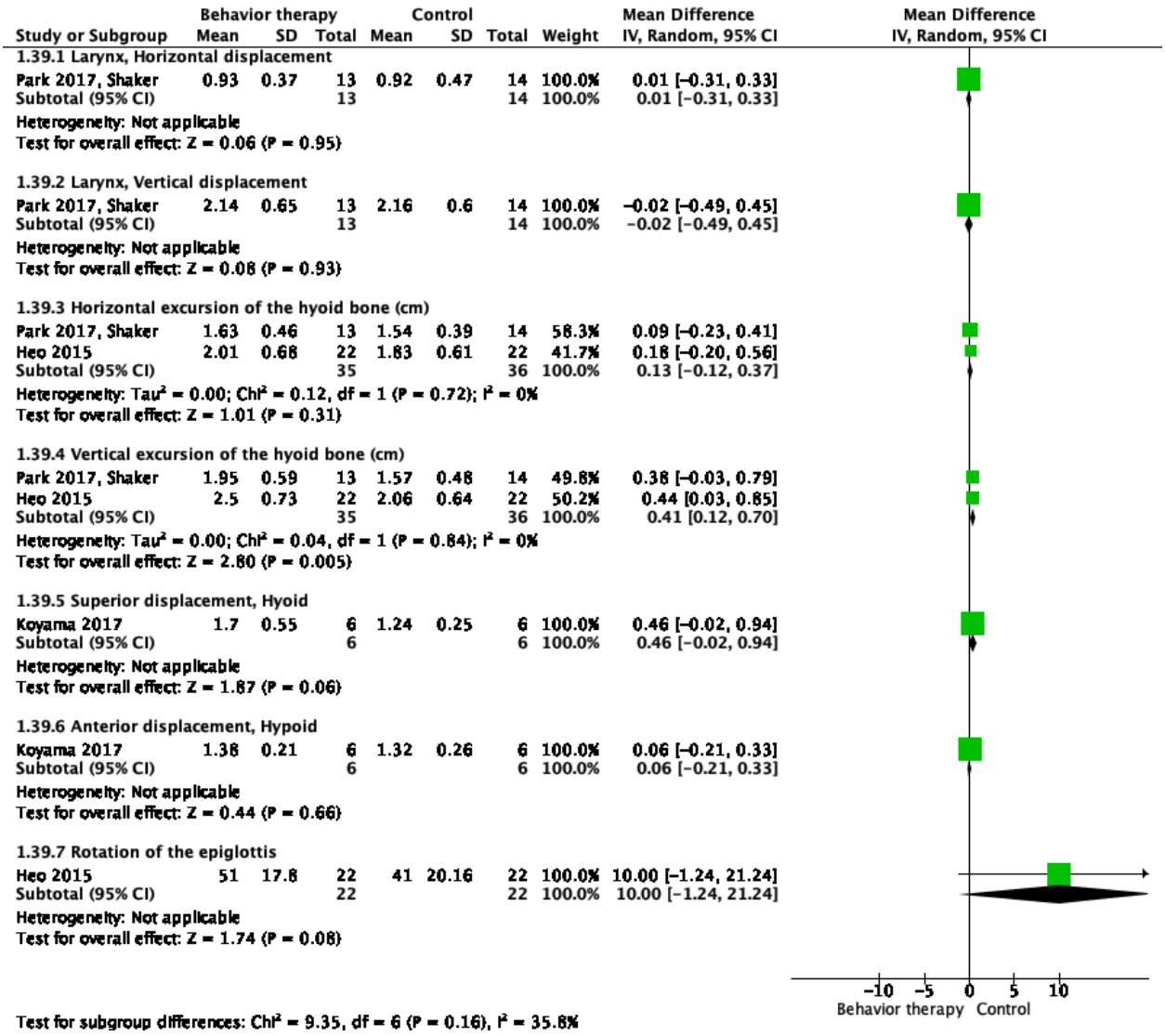


Table 10: Effect of behaviour therapy on hyoid bone, laryngeal and epiglottis movements in patients with dysphagia after stroke

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Behavior	Control				
sEMG with ESMT						
Change						
• RCT	0.9±1.0	-0.1±0.7	1(27)	1.12 [0.30, 1.94]	NA	0.002
Post-intervention						
• RCT	5.6±0.9	4.8±0.8	1(27)	0.91 [0.11, 1.71]	NA	0.01

CI: Confidence intervals; ICU: Intensive care unit; I^2: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; SD: Standard Deviation; SMD: Standard Mean Difference

Figure 26: Effect of behavior therapy on sEMG scores in patients with dysphagia after stroke

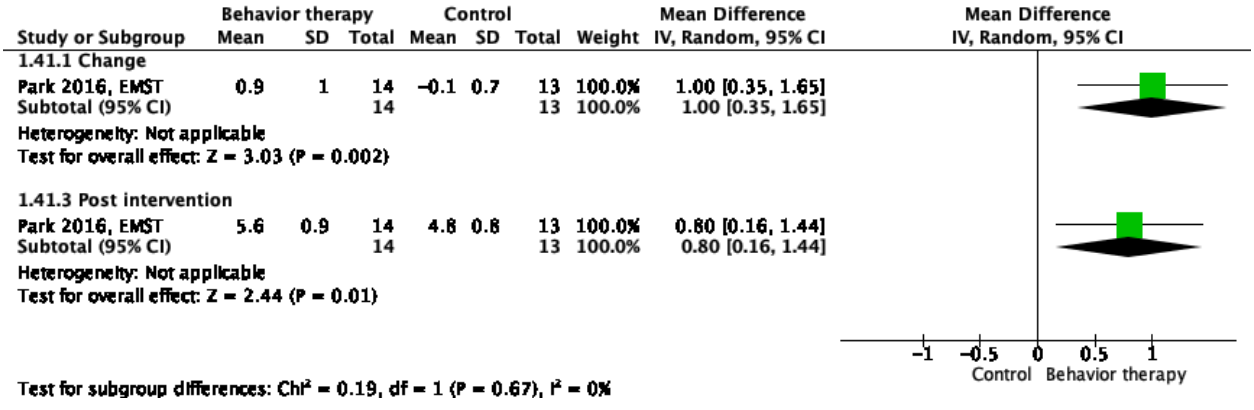


Table 11: Effect of behaviour therapy on neurological examination, Hb, arm circumference scores in patients with dysphagia after stroke

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Behavior	Control				
Neurological examination						
• **Change, NRCT**	-1.8±1.8	-0.5±2.1	1(49)	-1.33 [-2.58, -0.08]	NA	0.04
Hb						
• **Change, NRCT**	-0.3±1.0	-0.1±0.8	1(49)	-0.11 [-0.63, 0.41]	NA	0.68
Mid-arm circumference						
• **Change, NRCT**	0.7±1.8	0.9±2.1	1(49)	1.53 [0.26, 2.80]	NA	0.02

CI: Confidence intervals; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; SD: Standard Deviation; MD: Mean Difference

Figure 27: Effect of behavior therapy on Neurological examination, Hb, arm circumference

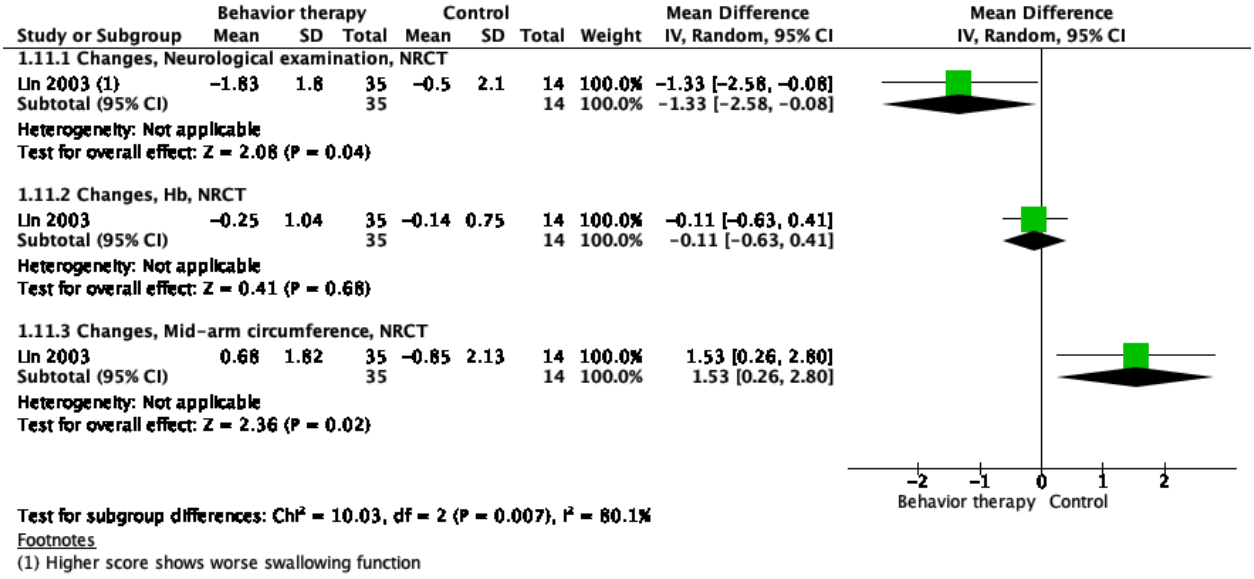


Table 12: Effect of behaviour therapy on swallowing functions scores in patients with dysphagia after stroke

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Behavior	Control				
Swallow vol/ sec						
• **Change, NRCT**	1.6±3.8	-1.4±4.3	1(49)	2.97 [0.39, 5.55]	NA	0.02
Volume/swallow						
• **Change, NRCT**	4.2±8.8	-1.6±8.7	1(49)	5.75 [0.34, 11.16]	NA	0.04
Cough/ Choking at timed swallow test						
• **Change, NRCT**	-0.2±0.6	0.0±0.4	1(49)	-0.24 [-0.53, 0.05]	NA	0.10
Coughing/ Choking at meals						
• **Change, NRCT**	-5.3±8.6	2.4±6.8	1(49)	-7.72 [-12.30, -3.14]	NA	0.009
Swallow questionnaire						
• **Change, NRCT**	-0.5±1.6	0.3±0.7	1(49)	-0.80 [-1.46, -0.14]	NA	0.02

CI: Confidence intervals; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; SD: Standard Deviation; MD: Mean Difference

Figure 28: Effect of behaviour therapy on swallowing functions scores in patients with dysphagia after stroke

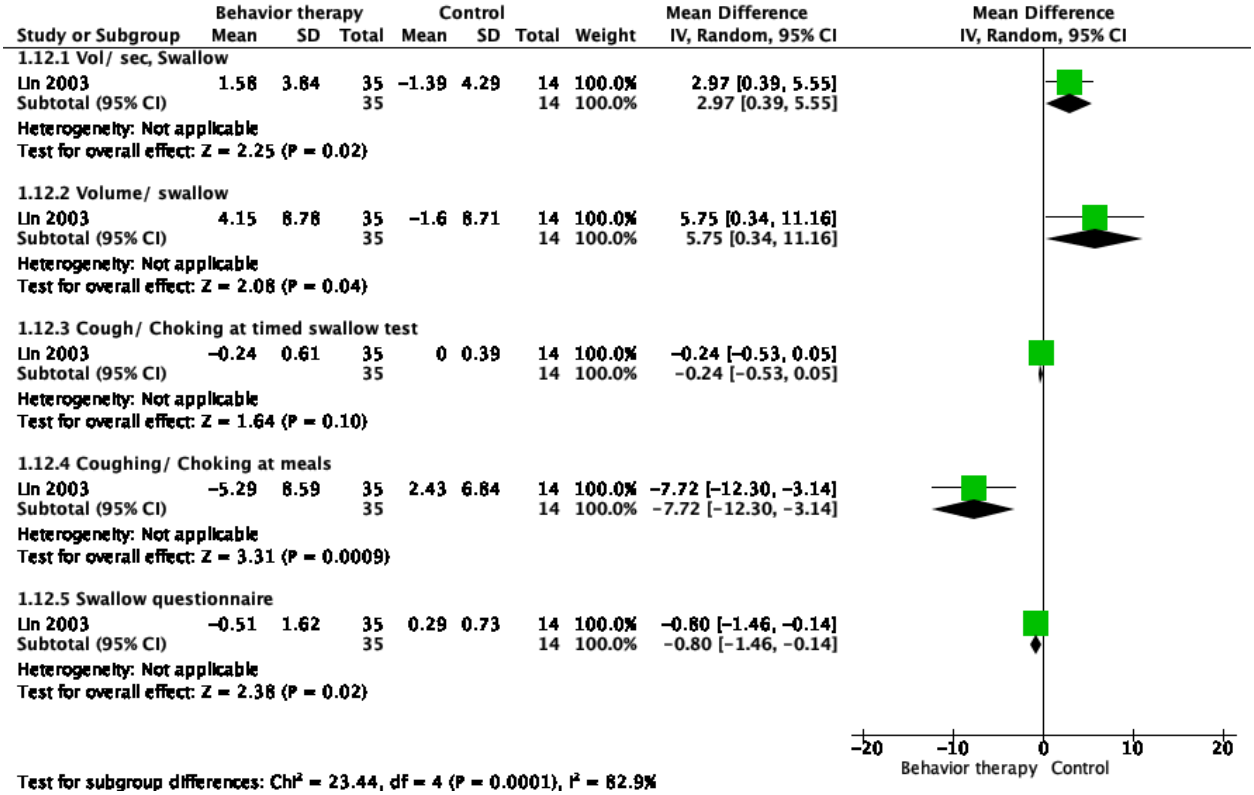
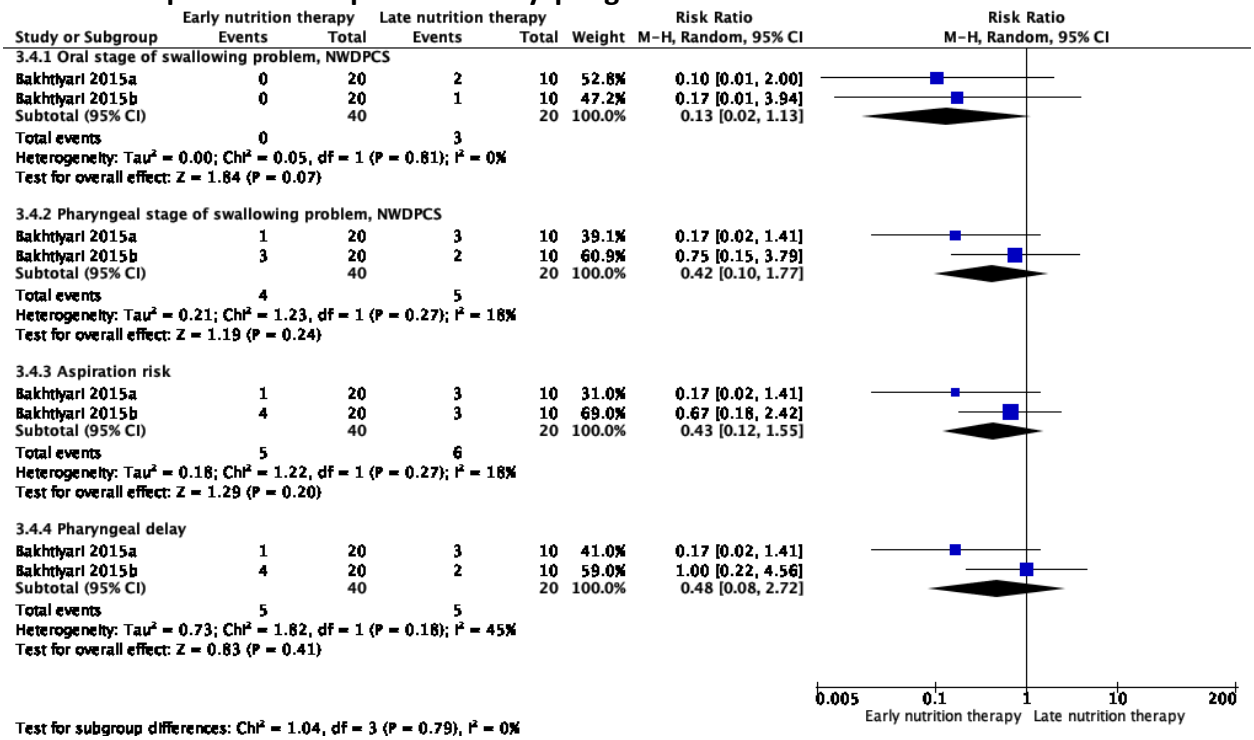


Table 13: Effect of early compared to late initiation of behavioural therapy on mRS and swallowing in patients with post-stroke dysphagia

Outcome	Incidence (%)		n (N)	RR [95% CI]	I^2	P value
	Early nutrition	Late nutrition				
Oral stage of swallowing problem, NWDPCS						
• RCT	0.0%	15.0%	1(60)	0.13 [0.02, 1.13]	0%	0.07
Pharyngeal stage of swallowing problem, NWDPCS						
• RCT	10.0%	25.0%	1(60)	0.42 [0.10, 1.77]	18%	0.24
Aspiration risk, NWDPCS						
• RCT	12.5%	30.0%	1(60)	0.43 [0.12, 1.55]	18%	0.2
Pharyngeal delay						
• RCT	12.5%	25.0%	1(60)	0.48 [0.08, 2.72]	45%	0.41
Infections						
• RCT	33.3%	52.1%	1(146)	0.64 [0.43, 0.94]	NA	0.02
Pressure sores						
• RCT	0.7%	1.3%	1(4023)	0.57 [0.31, 1.08]	NA	0.09
GIT hemorrhage						
• RCT	5.1%	2.6%	1(859)	2.00 [0.98, 4.08]	NA	0.06
Malnutrition						
• RCT	27.1%	48.3%	1(128)	0.56 [0.35, 0.90]	NA	0.02

CI: Confidence intervals; GIT: Gastrointestinal; I^2,p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; NWDPCS: North-Western dysphagia patients check sheet; p: Statistical significance value; RR: Risk Ratio

Figure 29: Effect of early compared to late initiation of behavioural therapy on swallowing functions in patients with post-stroke dysphagia



Treatment 2b - Acupuncture

Table 1: Effect of acupuncture on dysphagia in patients with dysphagia after stroke

Outcome	Mean±SD/ Incidence (%)		n (N)	MD/OR [95% CI]	I^2	P value
	Acupuncture	Control				
Dysphagia at end	20.0%	39.6%	23(2177)	0.51 [0.41, 0.63]	58%	< 0.00001
Dysphagia score, overall*						
• Improvement	4.0±0.8	2.8±0.9	3(292)	1.05 [0.45, 1.65]	81%	0.0006
• Post intervention	1.5±0.7	2.1±0.9	5(443)	-0.63 [-1.12, -0.14]	84%	0.01
DOSS						
• Change	4.0±1.3	2.1±1.1	1(120)	1.90 [1.47, 2.33]	NA	< 0.00001
• Post intervention	5.8±1.3	3.7±1.1	1(120)	2.10 [1.67, 2.53]	NA	< 0.00001
VFSS						
• Change	4.5±0.5	3.8±0.8	1(133)	0.71 [0.49, 0.93]	NA	< 0.00001
• Post intervention	9.8±0.5	9.4±0.8	1(133)	0.42 [0.20, 0.64]	NA	< 0.0001
RBHOMS						
• Change	2.1±0.6	1.9±0.6	1(39)	0.20 [-0.18, 0.58]	NA	0.30
• Post intervention	7.4±0.6	7.2±0.6	1(39)	0.20 [-0.18, 0.58]	NA	0.30
WST						
• Change	NR	NR	NA	NA	NA	NA
• Post intervention	2.4±0.6	2.9±0.9	2(151)	-0.60 [-0.84, -0.36]	0%	< 0.00001
Latent time in swallowing reflux						
• Post intervention	1.6±0.3	4.6±1.6	2(52)	-3.43 [-8.32, 1.47]	97%	0.17

*: Standard Mean Difference; CI: Confidence intervals; I^2: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; NR: Not reported; p: Statistical significance value; SD: Standard Deviation;; WST: Water swallow test

Figure 1: Effect of acupuncture on dysphagia at end in patients with dysphagia with stroke

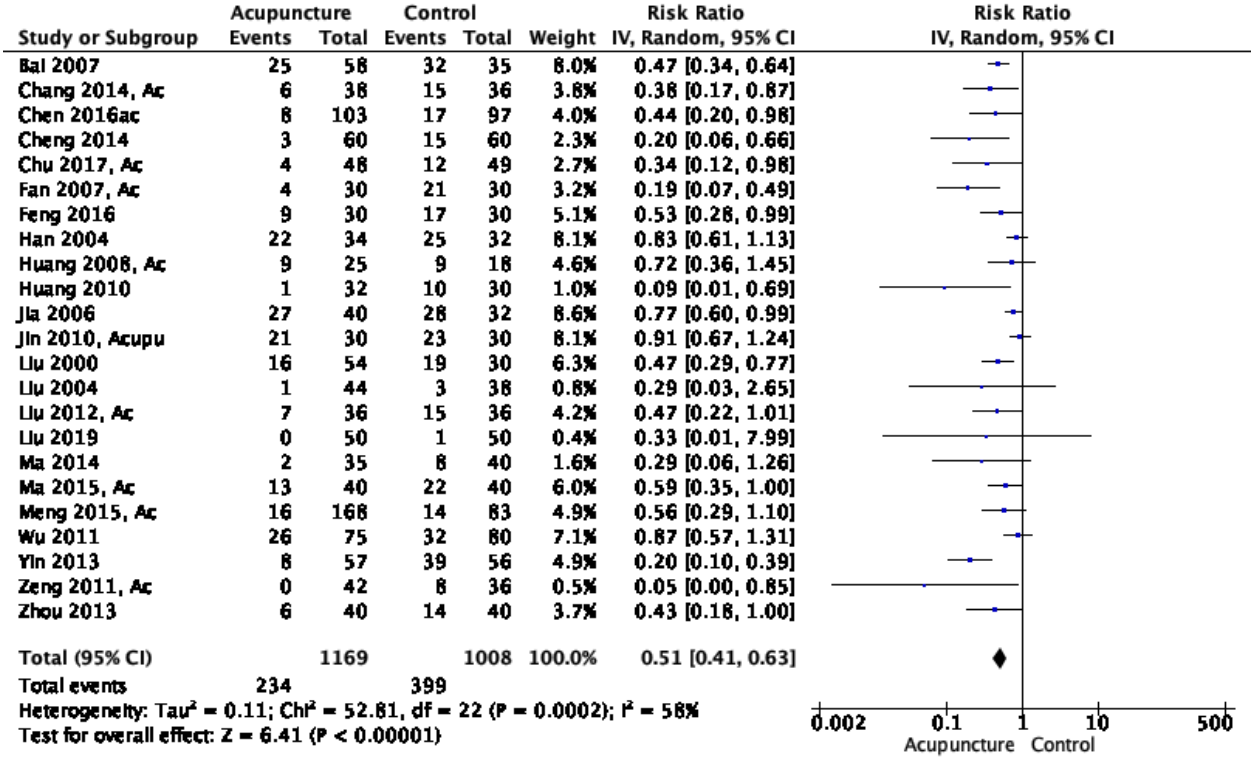


Figure 2: Effect of acupuncture on overall change in dysphagia score in patients with dysphagia with stroke

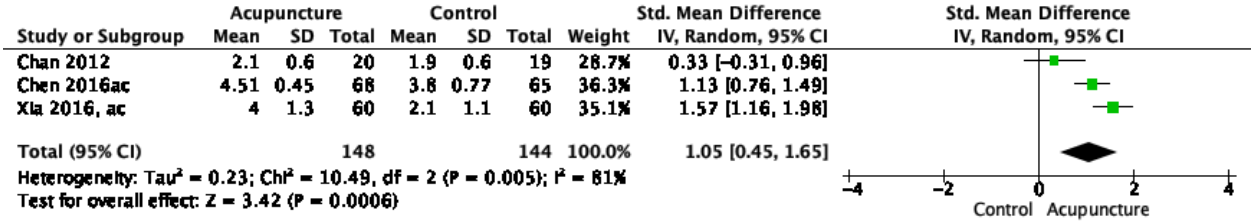


Figure 3: Effect of acupuncture on overall dysphagia score in patients with dysphagia with stroke

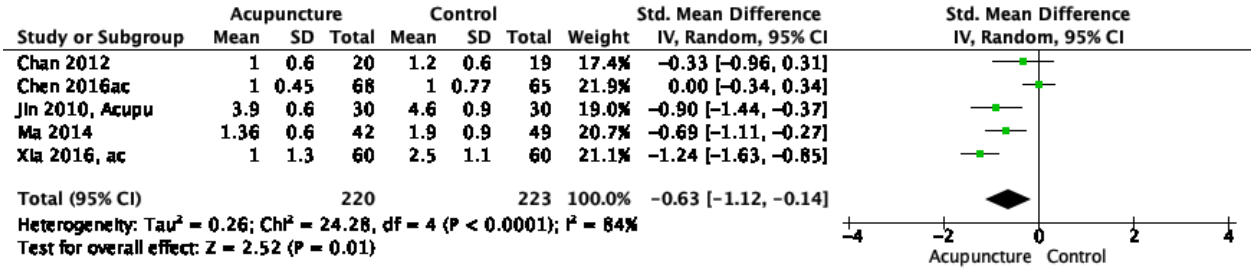


Figure 4: Effect of acupuncture on DOSS in patients with dysphagia with stroke

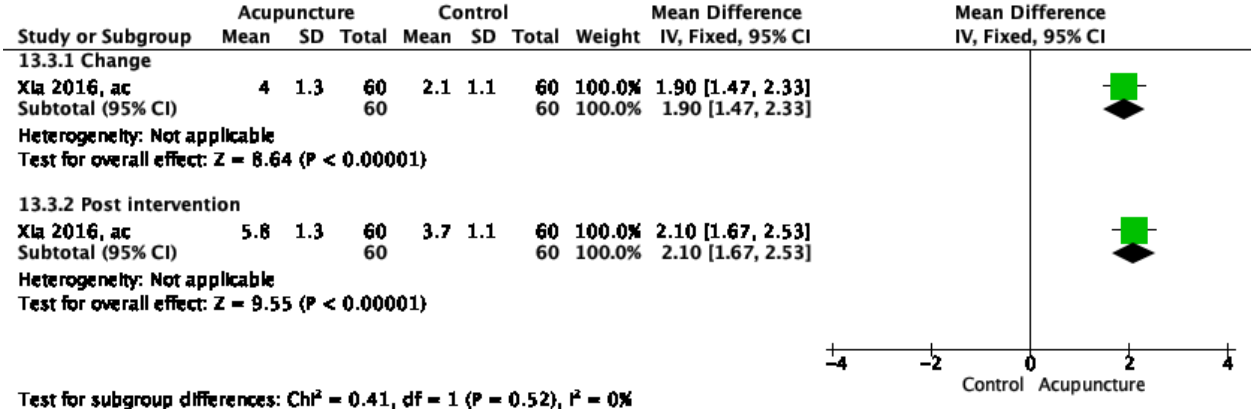


Figure 5: Effect of acupuncture on VFSS in patients with dysphagia with stroke

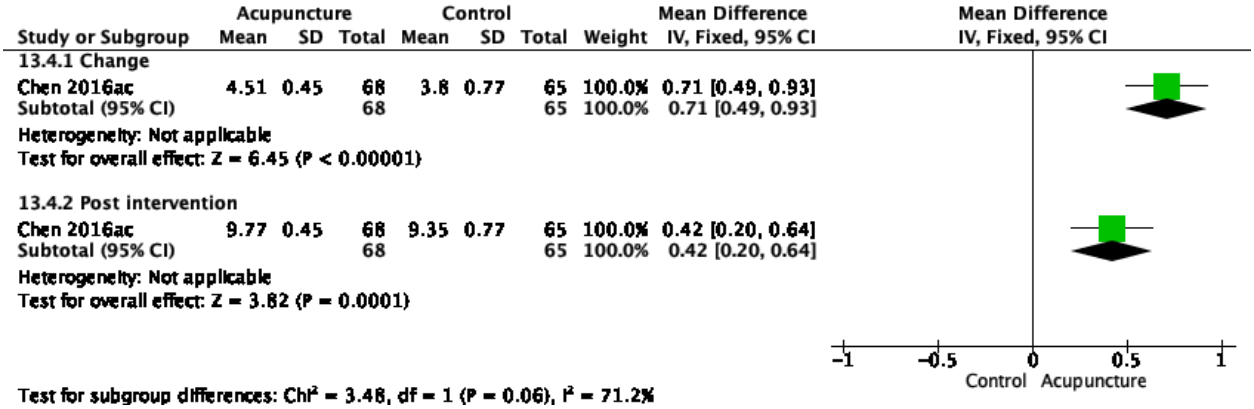


Figure 6: Effect of acupuncture on RBHOMS in patients with dysphagia with stroke

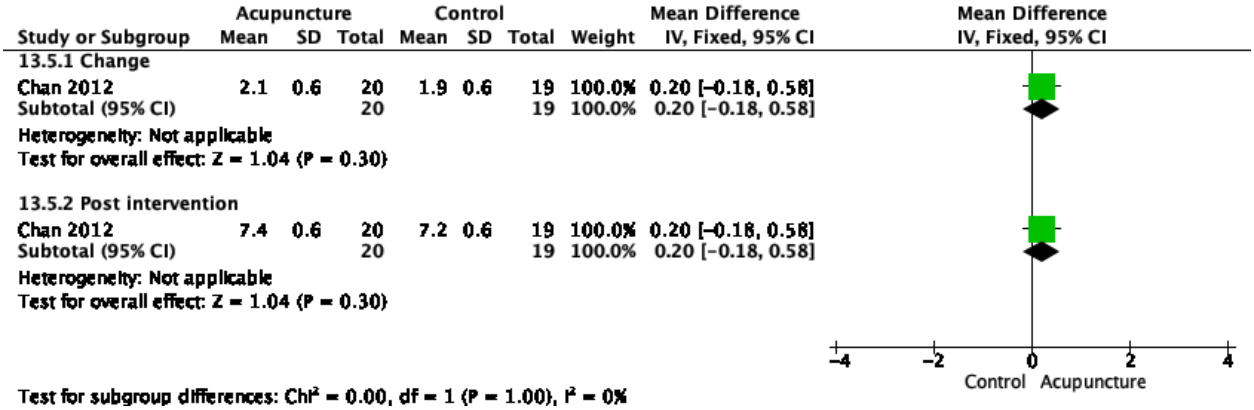


Figure 7: Effect of acupuncture on water swallow test in patients with dysphagia with stroke

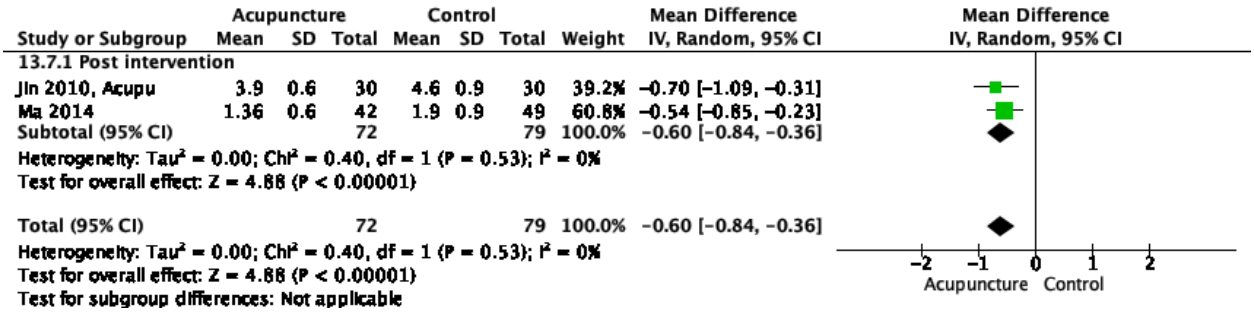


Figure 8: Effect of acupuncture on latent time in swallowing reflux in patients with dysphagia with stroke

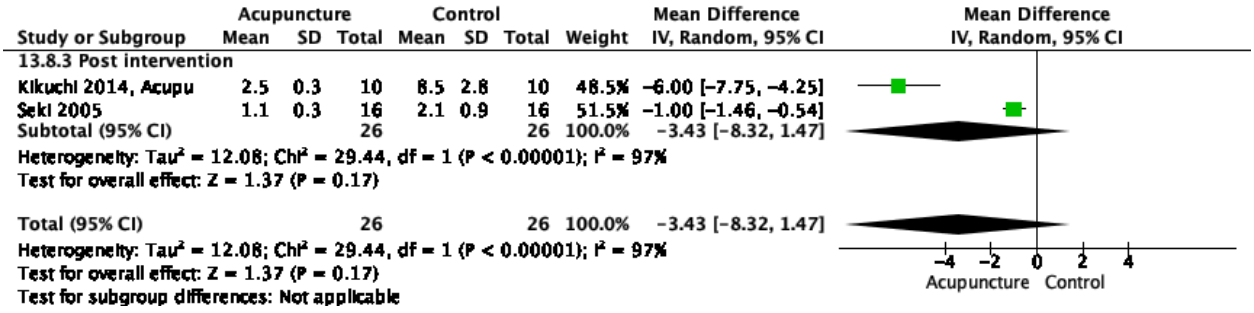


Table 2: Effect of acupuncture on dysphagia in patients with dysphagia after stroke

Outcome	Mean±SD/ Incidence (%)		n (N)	MD/OR [95% CI]	I^2	P value
	Acupuncture	Control				
Pneumonia	3.3%	8.3%	1(120)	0.40 [0.08, 1.98]	NA	0.26
SQoL	197±19	165±20	1(120)	32.0 [24.99, 39.01]	NA	<0.00001
MMSE	8.3±2.9	6.1±2.9	1(20)	2.20 [-0.34, 4.74]	NA	0.09
Nasal feeding tube removal	89.5%	50.0%	1(74)	1.79 [1.27, 2.53]	NA	0.0009
BI	78±11	63±12	2(140)	7.40 [-12.39, 27.19]	95%	0.46
FMA						
• Change	18.2±14.2	16.6±16.5	1(241)	1.61 [-2.27, 5.49]	NA	0.42
• Post intervention	64.4±14.2	66.9±16.5	1(241)	-2.44 [-6.32, 1.44]	NA	0.22
Adverse effects						
• Pain	1.7%	0.0%	1(120)	3.00 [0.12, 72.20]	NA	0.5
• Hematoma	3.3%	0.0%	1(120)	5.00 [0.25, 102.00]	NA	0.3
• Discomfort	11.7%	8.3%	1(120)	1.40 [0.47, 4.17]	NA	0.55

CI: Confidence intervals; FMA: Fugl-Meyer Assessment; I^2: Heterogeneity; MMSE: Mini Mental State Examination; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; SD: Standard Deviation; MD: Mean Difference; SQoL: Swallowing quality of life

Figure 9: Effect of acupuncture on pneumonia in patients with dysphagia with stroke

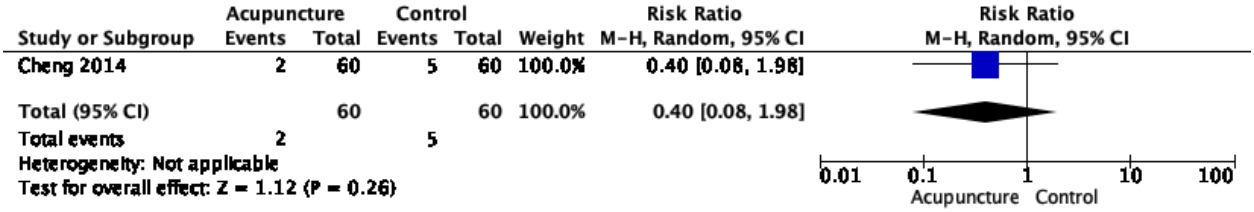


Figure 10: Effect of acupuncture on swallowing quality of life in patients with dysphagia with stroke

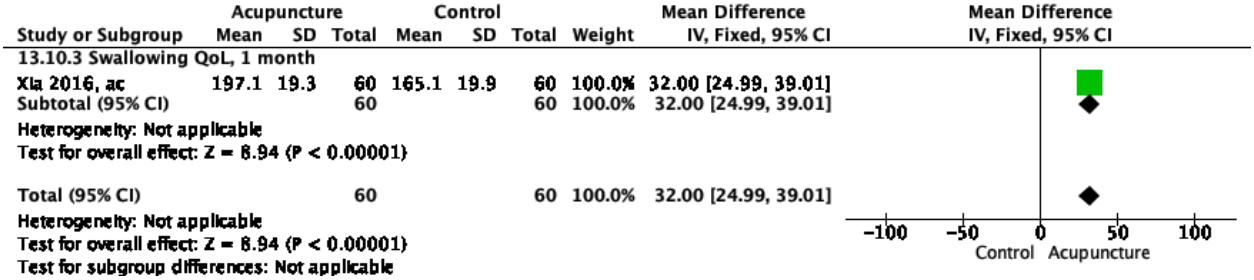


Figure 11: Effect of acupuncture on Mini-Mental State Examination in patients with dysphagia with stroke

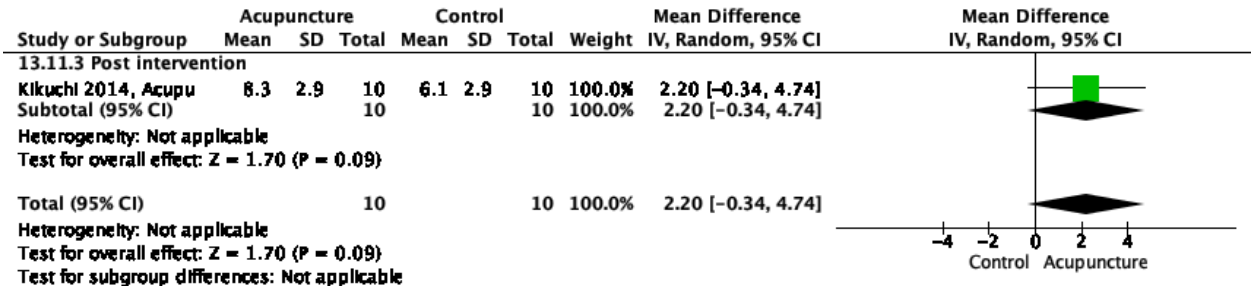


Figure 12: Effect of acupuncture on Nasal Feeding Tube Removal in patients with dysphagia with stroke

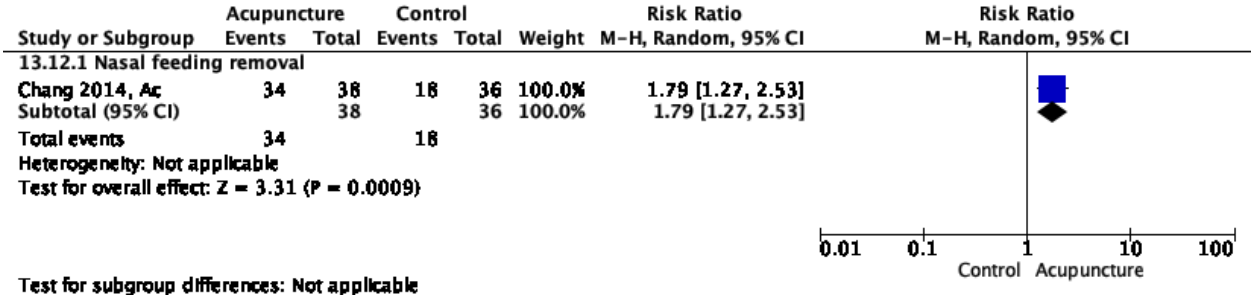


Figure 13: Effect of acupuncture on BI in patients with dysphagia with stroke

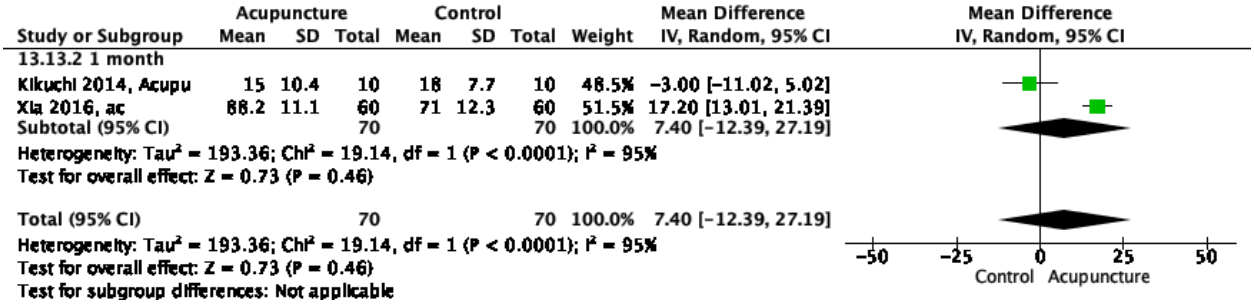


Figure 14: Effect of acupuncture on FM Assessment in patients with dysphagia with stroke

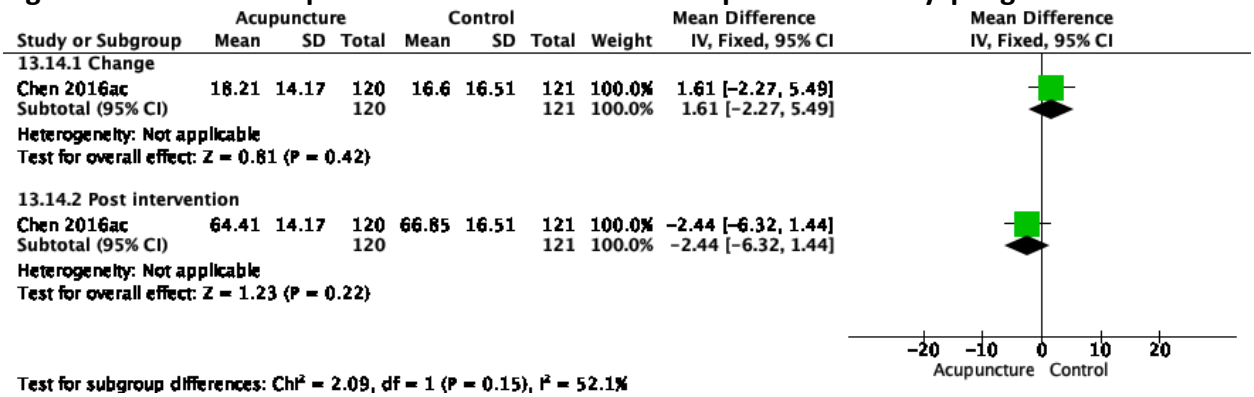
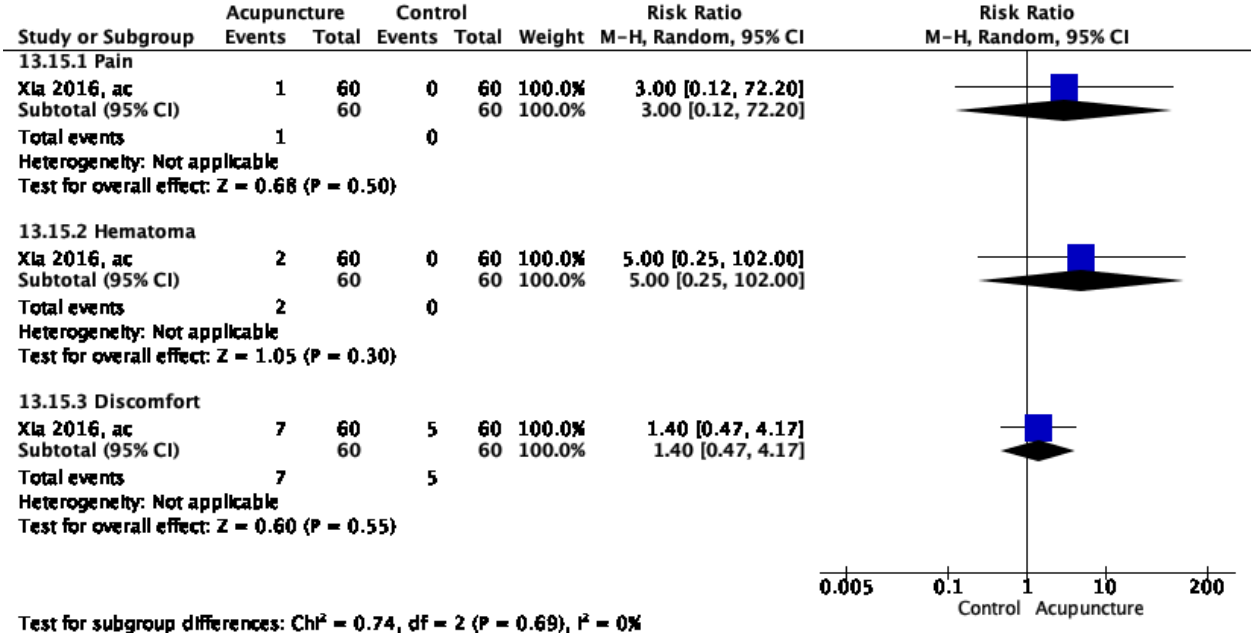


Figure 14: Effect of acupuncture on adverse effects in patients with dysphagia with stroke



Treatment 3 – Nutritional Therapy

Table 1: Effect of early compared to late initiation of oral nutrition therapy on mortality and pneumonia in patients with post-stroke dysphagia

Outcome	Incidence (%)		n (N)	RR [95% CI]	I^2	P value
	Early nutrition	Late nutrition				
Mortality						
• RCT	11.7%	12.6%	4(4337)	0.88 [0.57, 1.37]	26%	0.57
Pneumonia						
• RCT	6.4%	5.8%	1(4023)	1.12 [0.88, 1.42]	NA	0.38

CI: Confidence intervals; I^2,p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RR: Risk Ratio

Figure 1: Effect of early compared to late initiation of nutrition therapy on mortality in patients with post-stroke dysphagia

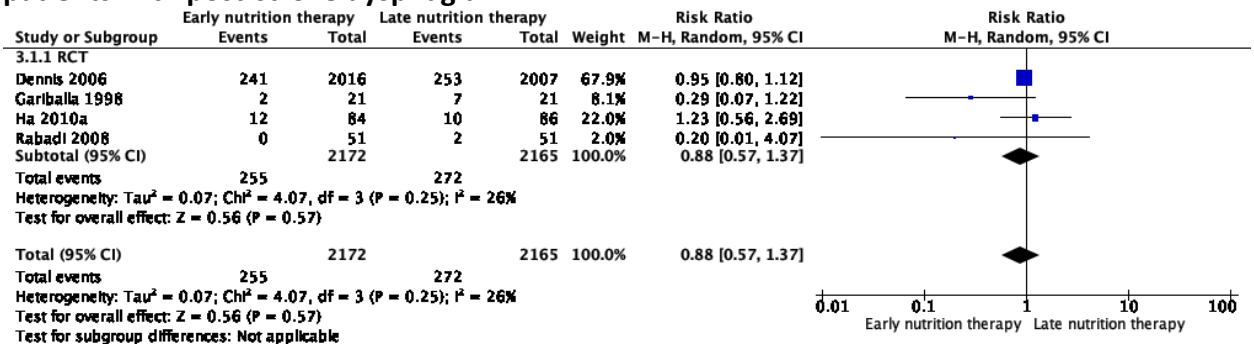


Figure 2: Effect of early compared to late initiation of nutrition therapy on pneumonia in patients with post-stroke dysphagia

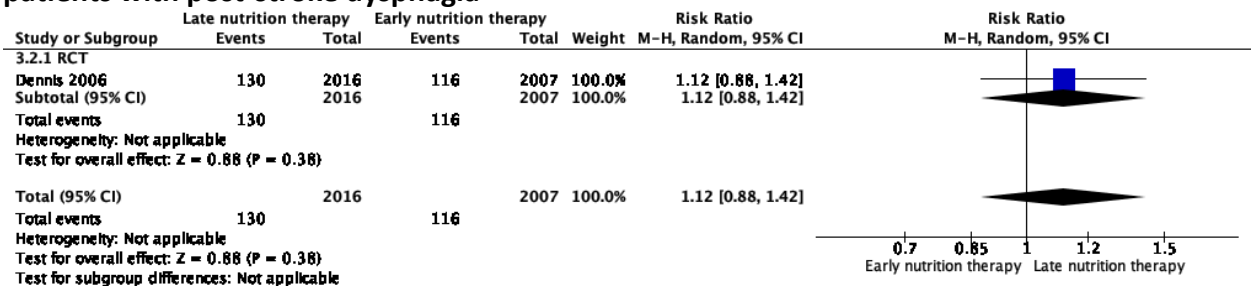


Table 2: Effect of early compared to late initiation of oral nutrition therapy on mRS and swallowing in patients with post-stroke dysphagia

Outcome	Incidence (%)		n (N)	RR [95% CI]	I^2	P value
	Early nutrition	Late nutrition				
MRS, RCT						
• **mRS, 0, 1**	23.4%	23.5%	1(4023)	1.00 [0.89, 1.11]	NA	0.94
• **mRS, 0-2**	40.4%	41.1%	1(4023)	0.98 [0.91, 1.06]	NA	0.68
Complications						
Recurrent stroke						
• RCT	2.5%	2.1%	1(4023)	1.16 [0.77, 1.73]	NA	0.48
Infections						
• RCT	8.5%	10.0%	1(4023)	0.86 [0.71, 1.04]	NA	0.12
Pressure sores						
• RCT	0.7%	1.3%	1(4023)	0.57 [0.31, 1.08]	NA	0.09
GIT hemorrhage						
• RCT	1.4%	0.9%	1(4023)	1.55 [0.86, 2.79]	NA	0.15

CI: Confidence intervals; GIT: Gastrointestinal; I^2: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RR: Risk Ratio

Figure 3: Effect of early compared to late initiation of nutrition therapy on mRS in patients with post-stroke dysphagia

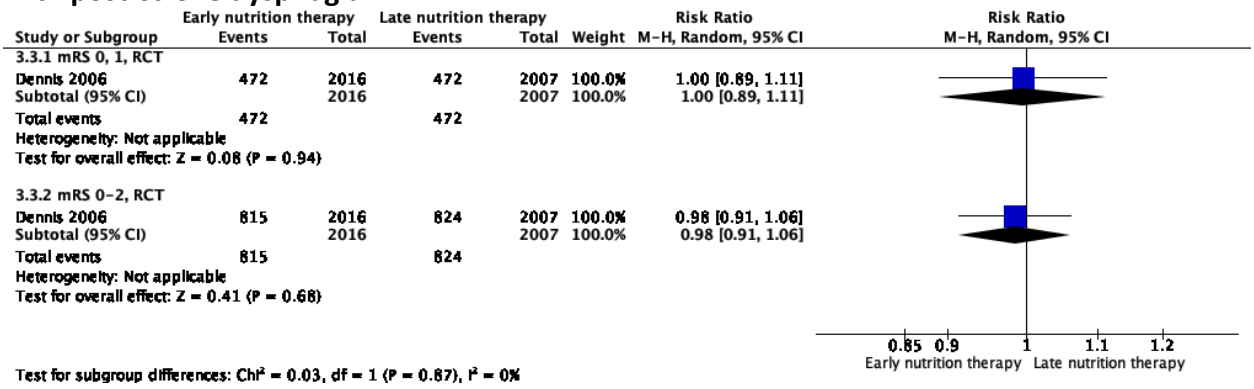


Figure 4: Effect of early compared to late initiation of oral nutrition therapy on complications in patients with post-stroke dysphagia

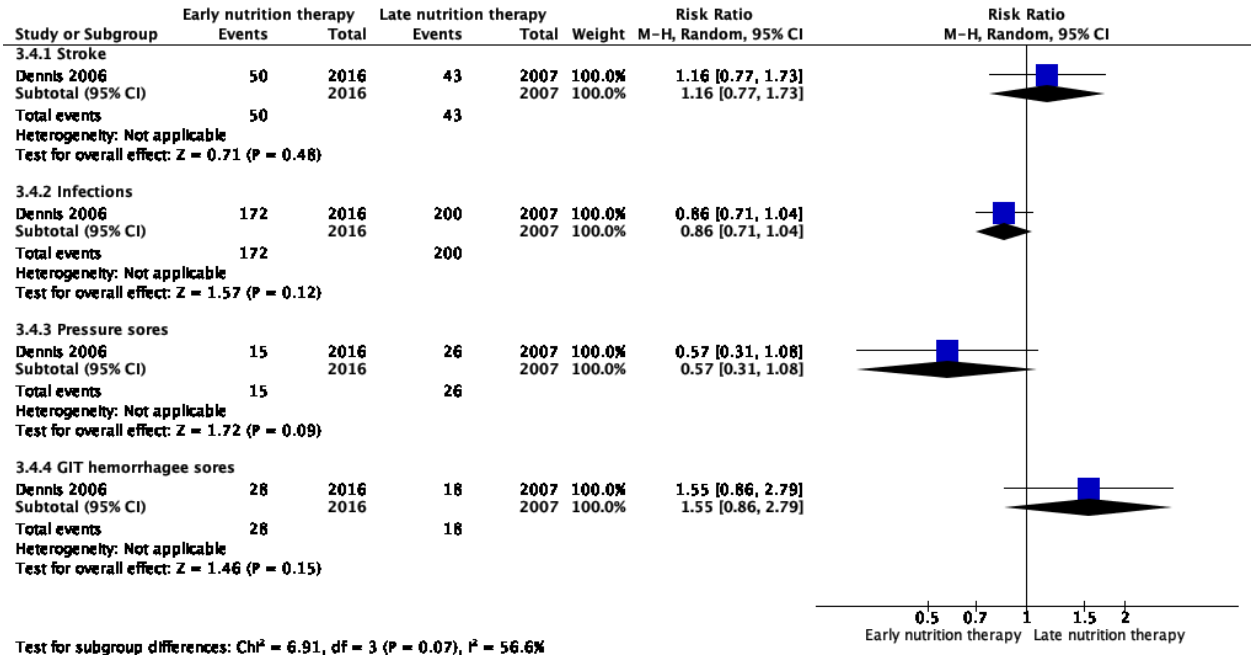


Table 3: Effect of early compared to late initiation of oral nutrition therapy on length of stay, living and tubing in patients with post-stroke dysphagia

Outcome	Incidence (%)/ Mean±SD		n (N)	RR [95% CI]/ MD [95% CI]	I^2	P value
	Early nutrition	Late nutrition				
Length of stay, days						
• RCT	31.1±46.5	31.4±43.2	4(4289)	0.93 [-1.05, 2.91]	0%	0.36
BI						
• RCT	45±25	35±30	1(40)	10.00 [-7.11, 27.11]	NA	0.25
Living at home						
• RCT	20.2%	18.4%	3(4165)	1.20 [0.95, 1.52]	38%	0.13
Living in institution						
• RCT	6.7%	7.0%	2(4063)	0.96 [0.77, 1.21]	0%	0.73

CI: Confidence intervals; I^2,p: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RR: Risk Ratio; SD: Standard deviation

Figure 5: Effect of early compared to late initiation of nutrition therapy on length of stay in hospital in patients with post-stroke dysphagia

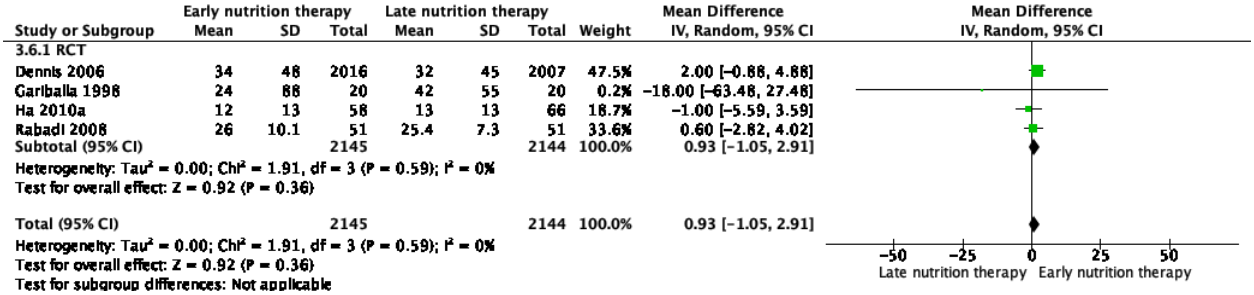


Figure 6: Effect of early compared to late initiation of nutrition therapy on activities of daily living Barthel index (ADLBI) in patients with post-stroke dysphagia

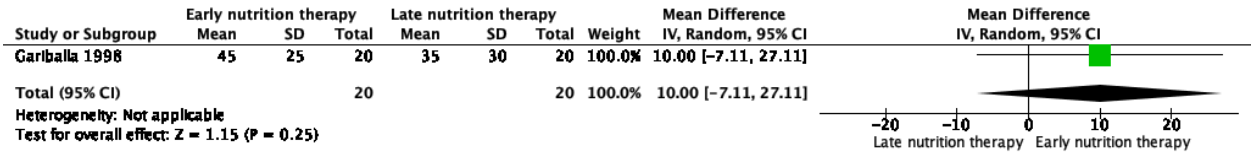


Figure 7: Effect of early compared to late initiation of nutrition therapy on home or institution living in patients with post-stroke dysphagia

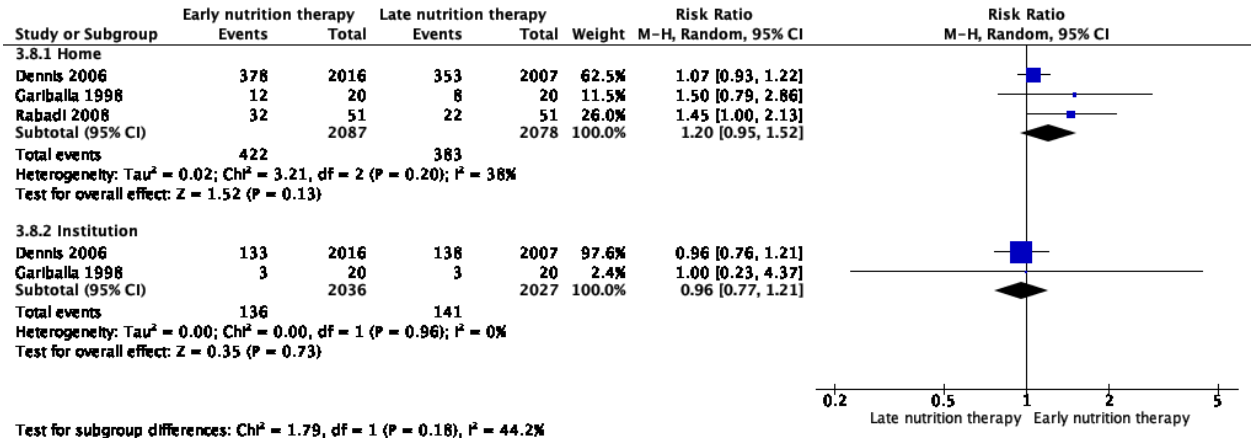


Table 4: Effect of early compared to late initiation of oral nutrition therapy on change in weight functional independence score, hand grip strength, energy and protein intake, energy and protein intake in patients with post-stroke dysphagia

Outcome	Incidence (%)/ Mean±SD		n (N)	RR [95% CI]/ MD [95% CI]	I^2	P value
	Early nutrition	Late nutrition				
Weight, change, kg						
• RCT	0.0±1.7	-1.1±2.1	4(315)	1.03 [0.17, 1.89]	91%	0.02
Arm circumference						
RCT	-0.3±2.1	-0.3±2.9	1(36)	0.00 [-1.65, 1.65]	NA	1.00
Triceps skin fold thickness						
RCT	-0.9±1.7	-0.6±1.8	1(36)	-0.30 [-1.44, 0.84]	NA	0.61
Functional independence measure, change						
• RCT	31.5±14.3	22.9±11.8	1(102)	8.60 [3.51, 13.69]	NA	0.0009
Handgrip strength, change						
• RCT	2.3±3.7	-0.3±4.9	1(121)	2.60 [1.06, 4.14]	NA	0.00009
Mini Mental State Examination						
• RCT	3.9±3.3	0.6±1.2	1(48)	3.30 [1.90, 4.70]	NA	< 0.00001
Energy, kj/kg						
• RCT	61.6±20.8	49.7±15.0	5(264)	8.25 [1.97, 14.53]	81%	0.01
Protein intake, g/kg						
• RCT	0.9±0.3	0.7±0.3	5(264)	0.21 [0.01, 0.41]	88%	0.04

CI: Confidence intervals; $I^{2,}$,p: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RR: Risk Ratio; SD: Standard deviation

Figure 8: Effect of early compared to late initiation of nutrition therapy on change in weight functional independence score and hand grip strength in patients with post-stroke dysphagia

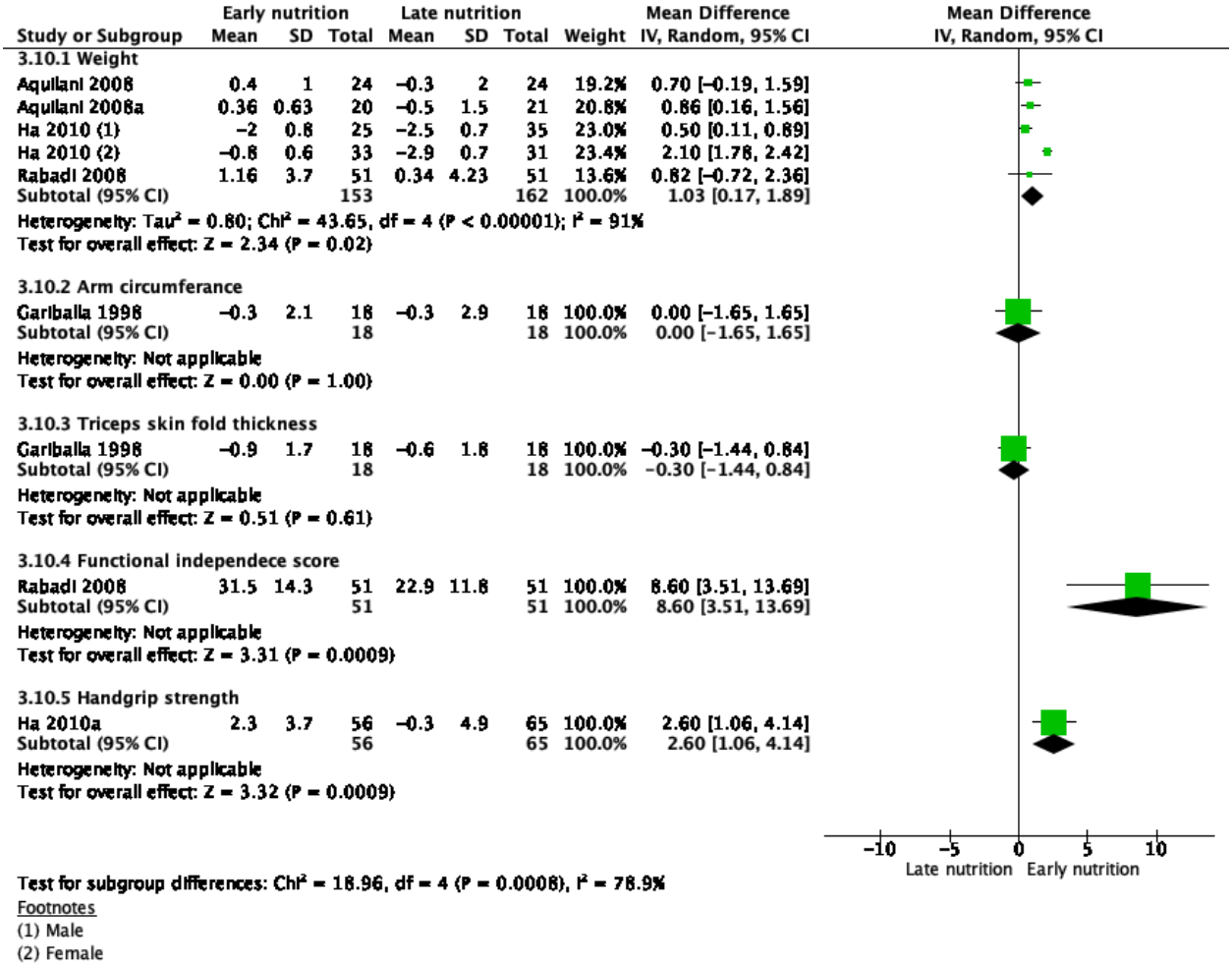


Figure 9: Effect of early compared to late initiation of nutrition therapy on Mini-mental state examination in patients with post-stroke dysphagia

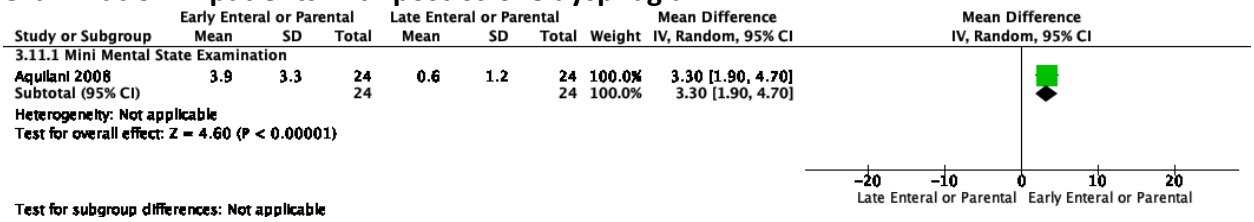
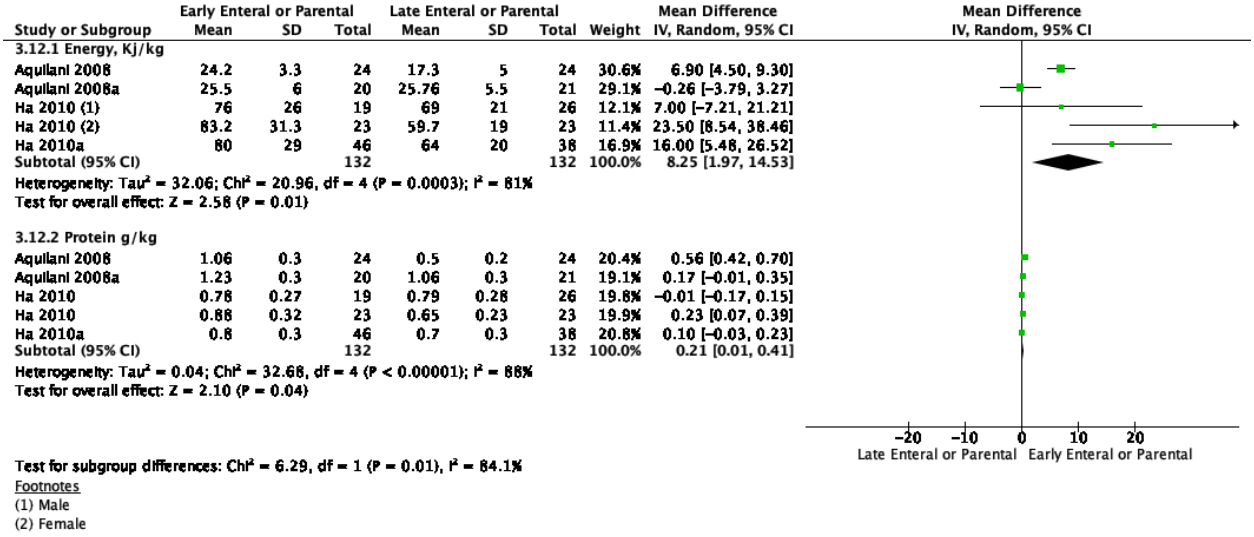


Figure 10: Effect of early compared to late initiation of nutrition therapy on energy and protein intake in patients with post-stroke dysphagia



Test for subgroup differences: Chi² = 6.29, df = 1 (P = 0.01), I² = 84.1%

Footnotes

(1) Male

(2) Female

Table 1: Effect of early compared to late or restrictive enteral or parenteral nutrition therapy on mortality and pneumonia in patients with post-stroke dysphagia

Outcome	Incidence (%)		n (N)	RR [95% CI]	I^2	P value
	Early Enteral or Parenteral	Late/ Restrictive Enteral or Parenteral				
Mortality						
• RCT	42.4%	48.1%	1(859)	0.88 [0.76, 1.02]	NA	0.09
Pneumonia						
• NRCT	28.4%	29.5%	2(1005)	0.97 [0.80, 1.17]	0%	0.75

CI: Confidence intervals; $I^{2,}$,p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RR: Risk Ratio

Figure 1: Effect of early compared to late or restrictive enteral or parenteral nutrition therapy on mortality in patients with post-stroke dysphagia

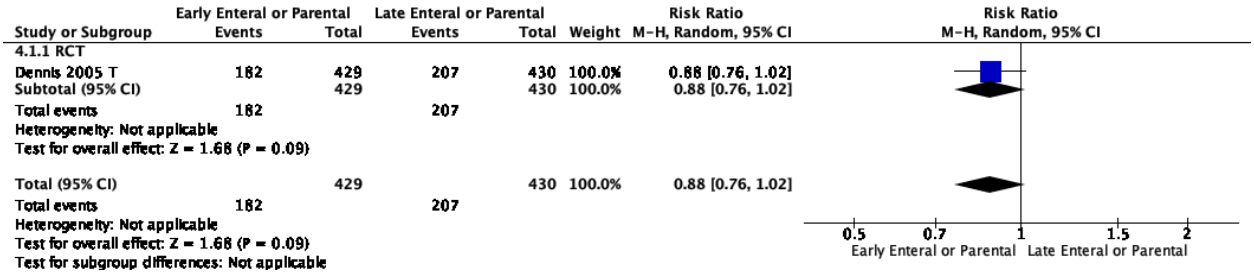


Figure 2: Effect of early compared to late or restrictive enteral or parenteral nutrition therapy on pneumonia in patients with post-stroke dysphagia

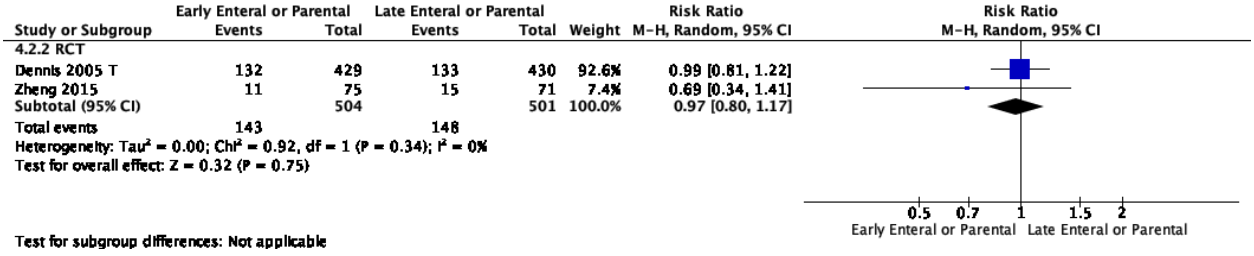


Table 2: Effect of early compared to late or restrictive enteral or parenteral nutrition therapy on mRS in patients with post-stroke dysphagia

Outcome	Incidence (%)		n (N)	RR [95% CI]	I^2	P value
	Early Enteral or Parenteral	Late/ Restrictive Enteral or Parenteral				
MRS						
mRS, 0, 1	5.7%	7.0%	2(981)	0.84 [0.36, 1.94]	65%	0.68
• RCT						
mRS, 0-2	9.3%	10.2%	1(859)	0.91 [0.61, 1.37]	NA	0.65
• RCT						
Complications						
Recurrent stroke						
• RCT	3.5%	5.3%	1(859)	0.65 [0.35, 1.24]	NA	0.19
Infections						
• RCT	23.8%	27.3%	2(1005)	0.80 [0.55, 1.18]	65%	0.27
Pressure sores						
• RCT	2.8%	2.3%	1(859)	1.20 [0.53, 2.75]	NA	0.66
Malnutrition						
• RCT	27.1%	48.3%	1(128)	0.56 [0.35, 0.90]	NA	0.02
GIT hemorrhage						
• RCT	5.1%	2.6%	1(859)	2.00 [0.98, 4.08]	NA	0.06

CI: Confidence intervals; GIT: Gastrointestinal; I^2,p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RR: Risk Ratio

Figure 3: Effect of early compared to late or restrictive enteral or parenteral nutrition therapy on mRS in patients with post-stroke dysphagia

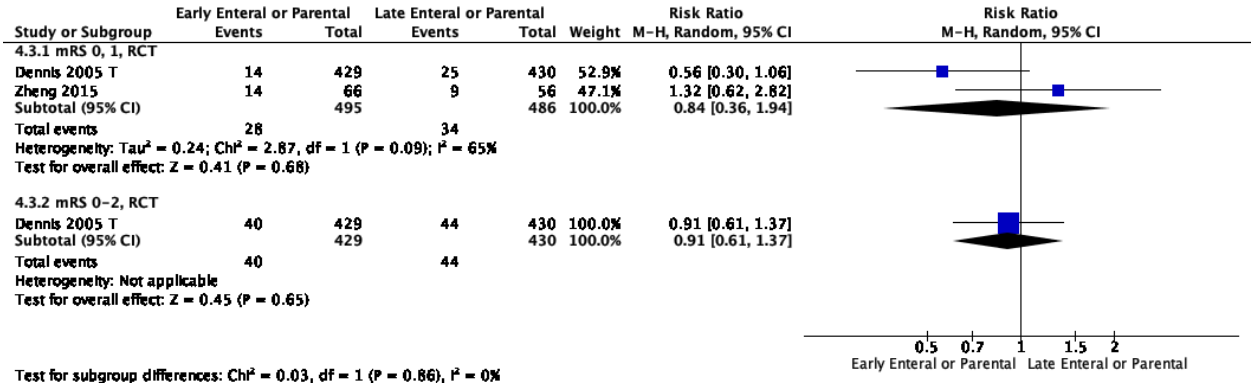


Figure 4: Effect of early compared to late or restrictive enteral or parenteral nutrition therapy on complication in patients with post-stroke dysphagia

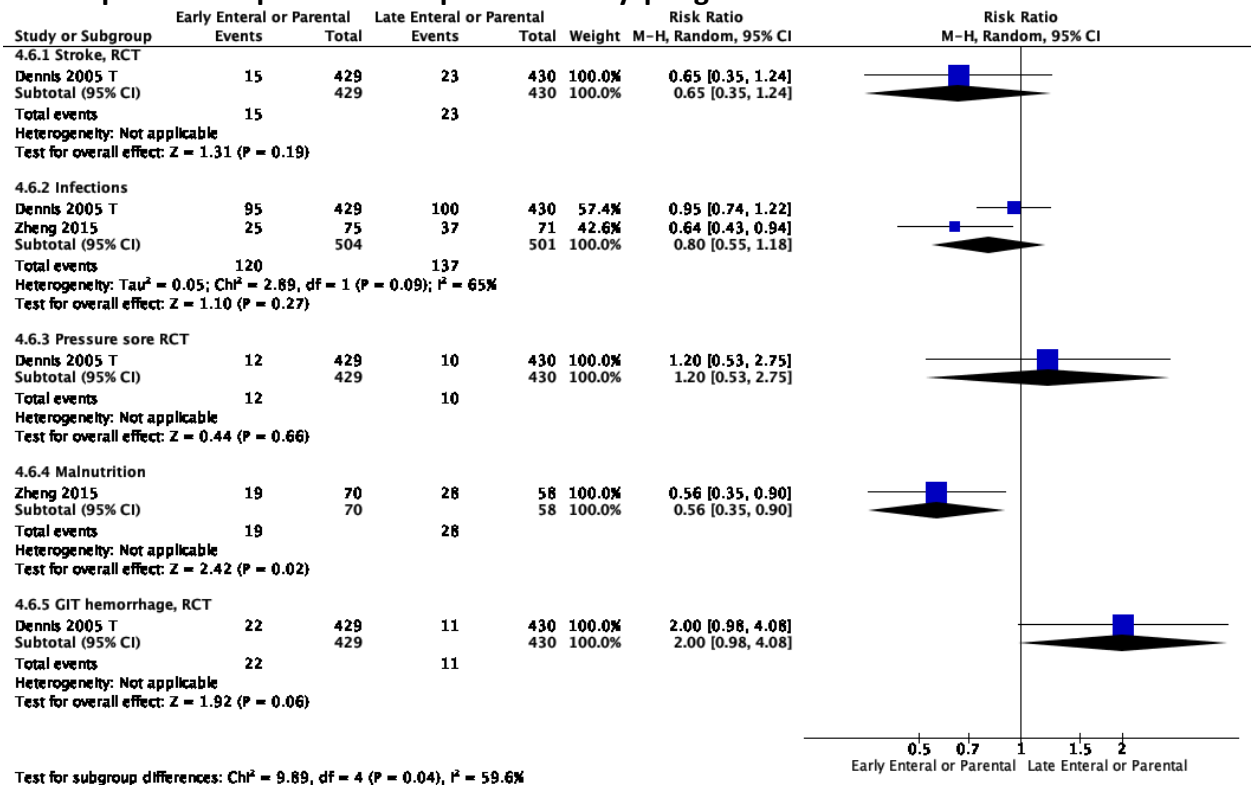


Table 3: Effect of early compared to late or restrictive enteral or parenteral nutrition therapy on length of stay, living and tubing and Quality of life in patients with post-stroke dysphagia

Outcome	Incidence (%)/ Mean±SD		n (N)	RR [95% CI]/ MD [95% CI]	I^2	P value
	Early Enteral or Parenteral	Late/ Restrictive Enteral or Parenteral				
Length of stay, days						
• RCT	45±58	44±50	1(859)	1.00 [-6.24, 8.24]	NA	0.79
BI						
• RCT	46.7±8.8	44.4±9.3	1(146)	2.30 [-0.64, 5.24]	NA	0.13
Living at home						
• RCT	35.7%	31.6%	1(859)	1.13 [0.93, 1.36]	NA	0.21
Living in Rehabilitation/ institution						
• RCT	21.9%	20.0%	1(859)	1.10 [0.84, 1.42]	NA	0.49
Nasogastric tube						
• RCT	7.0%	5.3%	1(859)	1.31 [0.77, 2.21]	NA	0.32
PEG						
• RCT	3.3%	2.3%	1(859)	1.40 [0.63, 3.12]	NA	0.41
• **Quality of life**						
• **Utilities**						
• RCT (Dennis 2005 T)	NR	NR	1(859)	0.013	NA	0.76

CI: Confidence intervals; I^2,p: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RR: Risk Ratio; SD: Standard deviation

Figure 5: Effect of early compared to late or restrictive enteral or parenteral nutrition therapy on length of stay in patients with post-stroke dysphagia

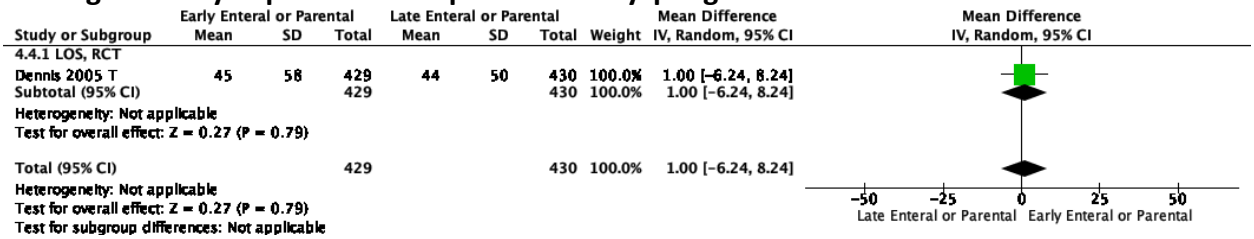


Figure 6: Effect of early compared to late or restrictive enteral or parenteral nutrition therapy on activities of daily living Barthel index (ADLBI) in patients with post-stroke dysphagia

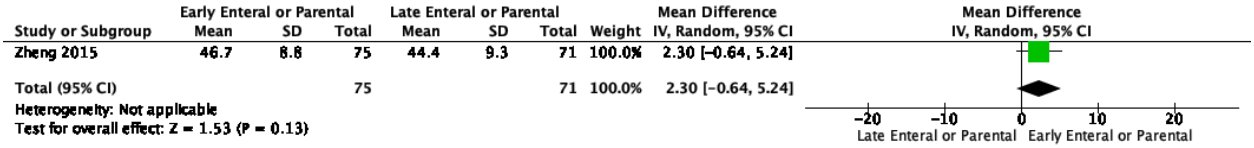


Figure 7: Effect of early compared to late or restrictive enteral or parenteral nutrition therapy on living or discharge in patients with post-stroke dysphagia

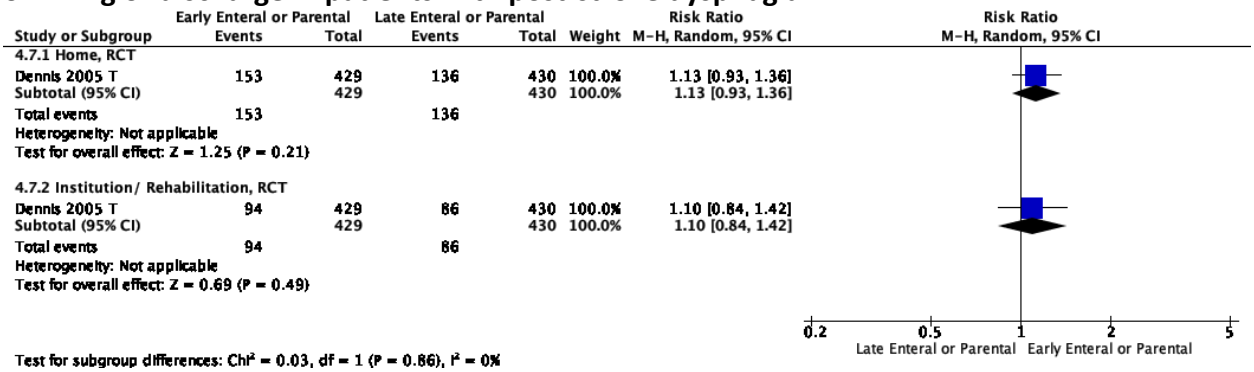
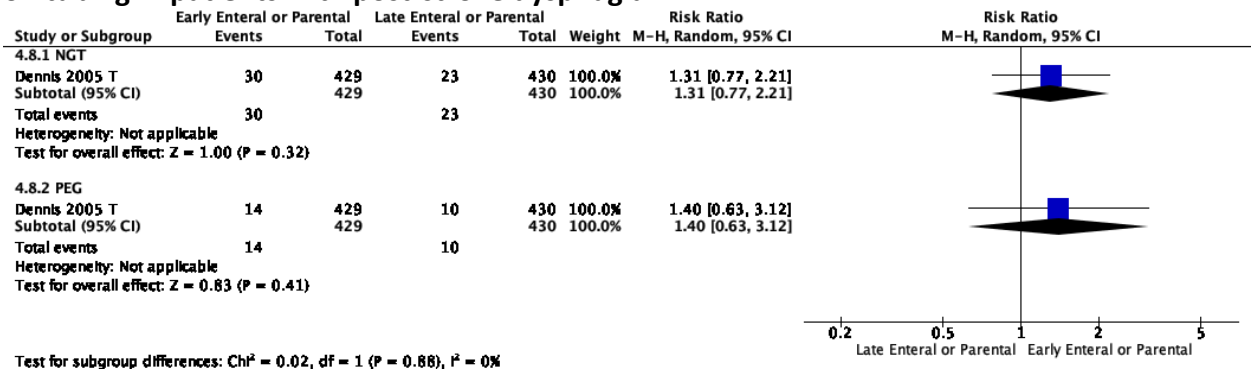


Figure 8: Effect of early compared to late or restrictive enteral or parenteral nutrition therapy on tubing in patients with post-stroke dysphagia



Treatment 4 – Oral Health Interventions

Table 1: Effect of oral health on mortality in patients with dysphagia after stroke

Outcome	Incidence %		n (N)	OR [95% CI]	I^2	P value
	Oral health	Control				
Mortality						
• Overall	17.4%	29.8%	3(349)	0.66 [0.45, 0.96]	0%	**0.03**
• RCT	8.7%	14.0%	1(203)	0.62 [0.28, 1.38]	NA	0.24
• NRCT	32.8%	47.7%	2(146)	0.67 [0.44, 1.03]	0%	0.07
In-patients						
• RCT	8.7%	11.0%	1(203)	0.79 [0.34, 1.83]	NA	0.59
1 month						
• RCT	NR	NR	NR	NR	NR	NR
• NRCT	12.1%	25.0%	2(146)	0.48 [0.22, 1.05]	0%	0.07
3 months						
• RCT	8.7%	14.0%	1(203)	0.62 [0.28, 1.38]	NA	0.24
6 months						
• RCT	NR	NR	NR	NR	NR	NR
• NRCT	32.8%	47.7%	2(146)	0.67 [0.44, 1.03]	0%	0.07

CI: Confidence intervals; I^2: Heterogeneity; n: Number of studies; N: Number of patients; NR: Not reported; p: Statistical significance value; OR: Odds ratio

Figure 1: Effect of oral health on mortality in patients with dysphagia after stroke

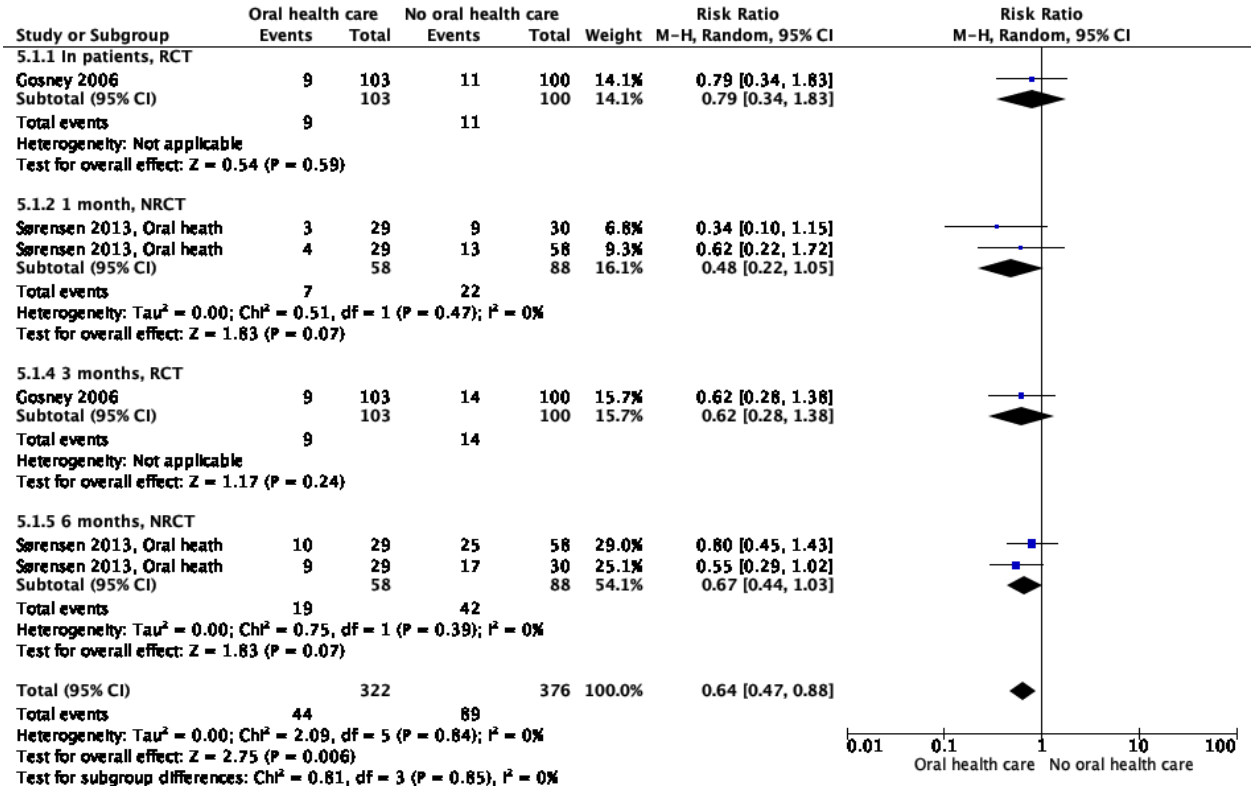


Table 2: Effect of oral health on pneumonia in patients with dysphagia after stroke

Outcome	Incidence %		n (N)	OR [95% CI]	I^2	P value
	Oral health	Control				
Pneumonia						
• Overall	8.7%	13.9%	7(2110)	0.39 [0.17, 0.91]	53%	0.03
• RCT	0.6%	5.6%	3(284)	0.14 [0.02, 1.11]	NA	0.06
• NRCT	10.0%	15.2%	4(1826)	0.47 [0.21, 1.06]	51%	0.07
Symptoms of RTI						
• RCT	0.4±0.7	0.6±0.7	1(94)	-0.20 [-0.48, 0.08]	NA	0.17

CI: Confidence intervals; I^2: Heterogeneity; n: Number of studies; N: Number of patients; NR: Not reported; p: Statistical significance value; RTI: respiratory tract infection; OR: Odds ratio

Figure 2: Effect of oral health on pneumonia in patients with dysphagia after stroke

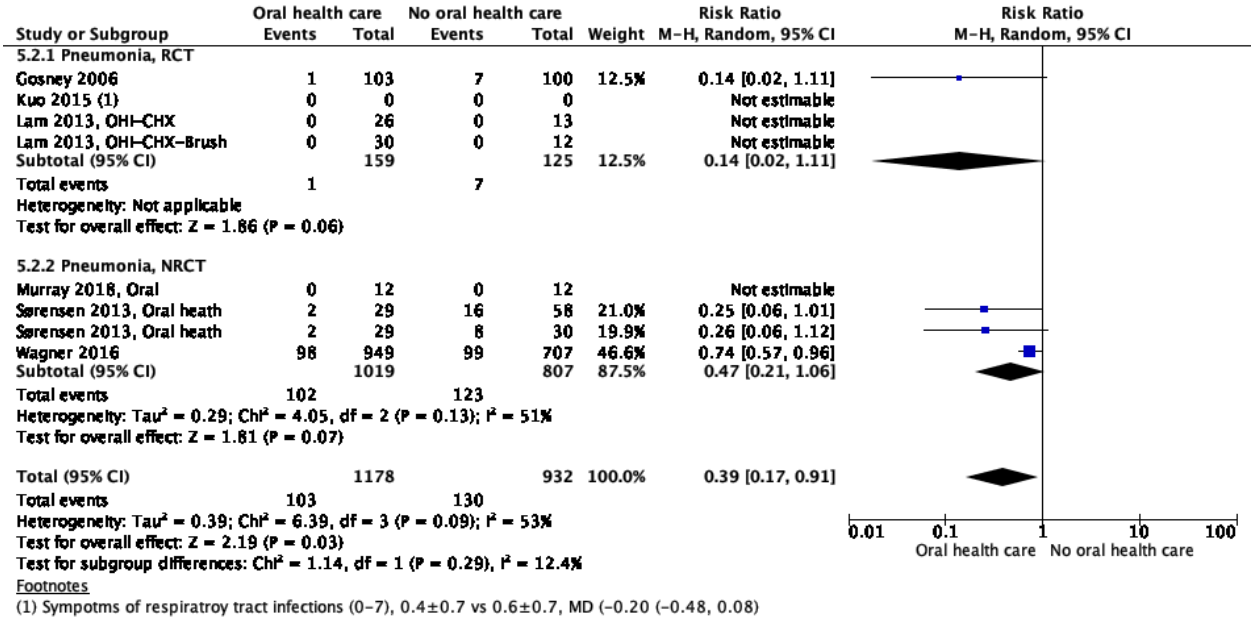
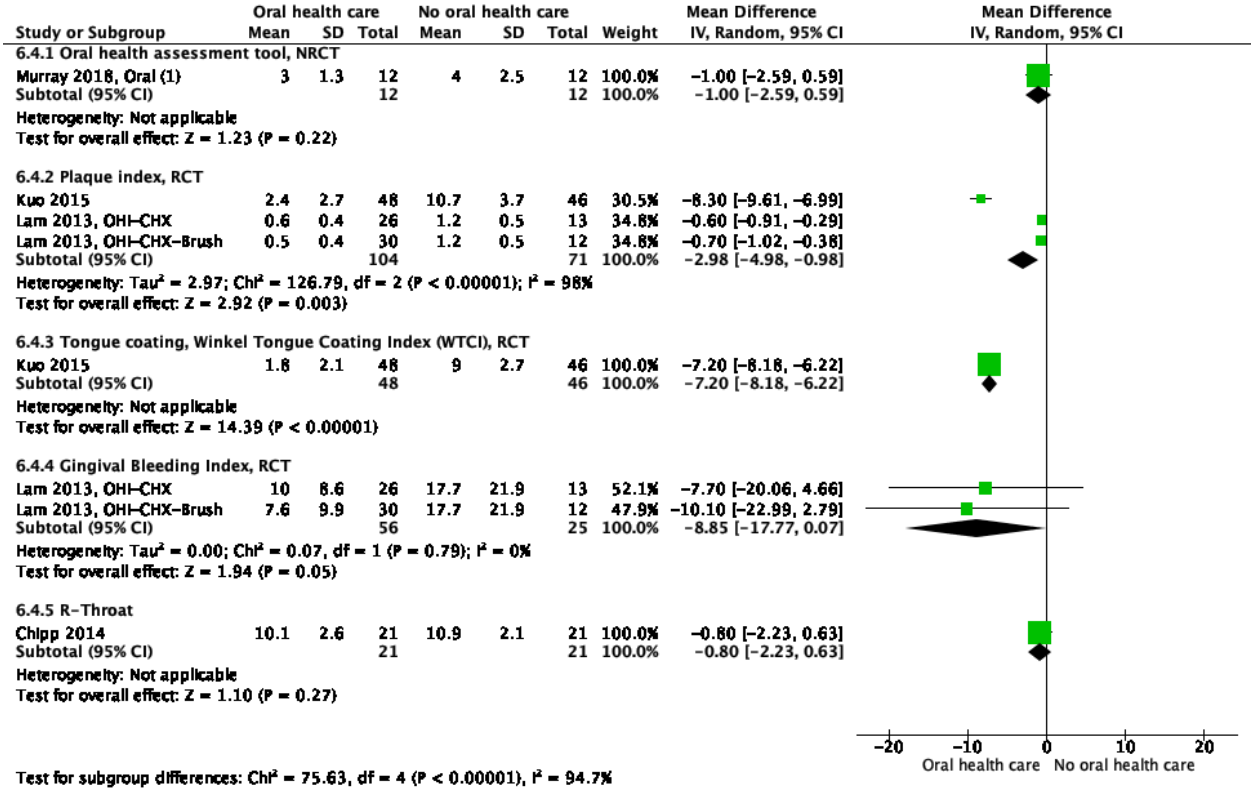


Table 3: Effect of oral health on oral index in patients with dysphagia after stroke

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Oral health	Control				
Oral Health						
• Overall*	NA	NA	6(235)	-1.27 [-2.26, -0.28]	93%	0.01
OHAT						
• RCT	NR	NR	NR	NR	NR	NR
• NRCT	3.0±1.3	4.0±2.5	1(24)	-1.00 [-2.59, 0.59]	NA	0.22
Oral index						
Plaque index						
• RCT	1.4±1.5	7.4±2.6	3(175)	-2.98 [-4.98, -0.98]	98%	0.003
Tongue coating, WTCI						
• RCT	1.8±2.1	9.0±2.7	1(94)	-7.20 [-8.18, -6.22]	NA	<0.00001
Gingival bleeding index						
• RCT	8.7±9.3	17.7±21.9	2(81)	-8.85 [-17.77, 0.07]	27%	0.05
R-Throat						
• RCT	10.1±2.6	10.9±2.1	1(42)	-0.80 [-2.23, 0.63]	NA	0.27

I^2: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; p: Statistical significance value; OHAT: Scores on oral health assessment tool; SD: Standard Deviation; WTCI: Winkel Tongue Coating Index; *: SMD

Figure 3: Effect of oral health on Oral Health Assessment Tool (OHAT) and R-throat and oral index in patients with dysphagia after stroke



Test for subgroup differences: Chi² = 75.63, df = 4 (P < 0.00001), I² = 94.7%

Footnotes

(1) OHAT: Lower the store, better the health; Good (≤3), poor (≥4)

Table 4: Effect of oral health on outcomes in patients with dysphagia after stroke

Outcome	Incidence % Mean±SD		n (N)	OR/ MD [95% CI]	I^2	P value
	Oral health	Control				
FOIS						
Change						
• RCT	2.9±1.2	0.6±0.8	1(43)	2.30 [1.70, 2.90]	NA	<0.00001
Post intervention						
• RCT	5.8±1.1	3.6±2.1	1(43)	2.20 [1.14, 3.26]	NA	<0.001
Tubing						
Overall	18.1%	29.1%	4(1853)	0.62 [0.48, 0.79]	36%	0.0001
• RCT	41.4%	100.0%	51 (1)	0.43 [0.28, 0.65]	NA	< 0.0001
• NRCT	17.5%	27.2%	1802 (3)	0.68 [0.57, 0.81]	0%	< 0.0001
NPO						
• RCT	NR	NR	NR	NR	NR	NR
• NRCT	3.9%	24.2%	1(84)	0.16 [0.04, 0.72]	NA	0.02
PEG						
• RCT	NR	NR	NR	NR	NR	NR
• NRCT	12.1%	9.1%	2(146)	1.41 [0.51, 3.90]	0%	0.5
Unintended oral feeding						
• RCT	NR	NR	NR	NR	NR	NR
• NRCT	31.8%	54.5%	1(44)	0.58 [0.28, 1.20]	NA	0.14
Length of stay						
• RCT	NR	NR	NR	NR	NR	NR
• NRCT	11.7±9.7	16.8±7.6	2(200)	-3.21 [-5.26, -1.16]	0%	0.002

CI: Confidence intervals; I^2: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; NPO: Nil per oral; p: Statistical significance value; PEG: Percutaneous endoscopic gastrostomy; OR: Odds ratio; SD: Standard Deviation; WTCI: Winkel Tongue Coating Index

Figure 4: Effect of oral health on FOIS in patients with dysphagia after stroke

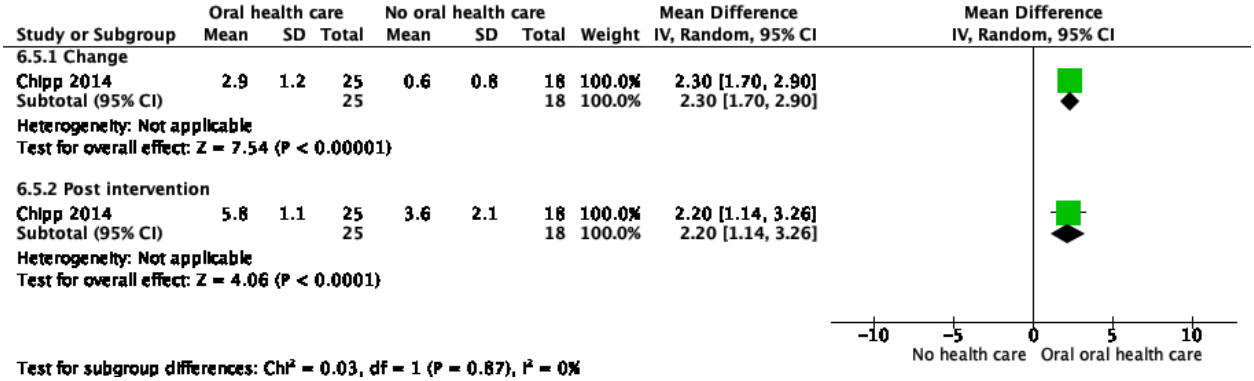


Figure 5: Effect of oral health on tubing, NPO, PEG and unintended oral feeding in patients with dysphagia after stroke

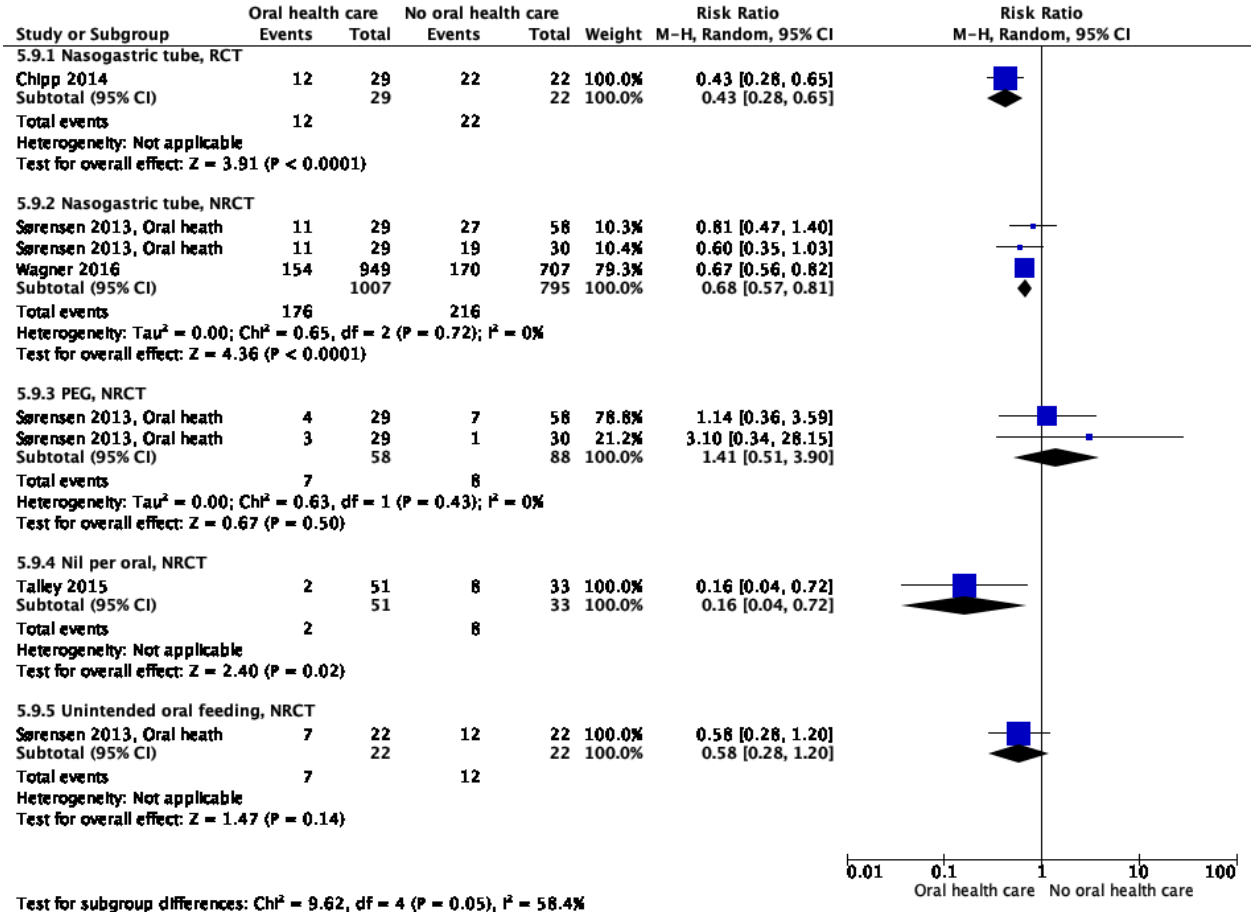


Figure 6: Effect of oral health on length of stay in hospital in patients with dysphagia after stroke

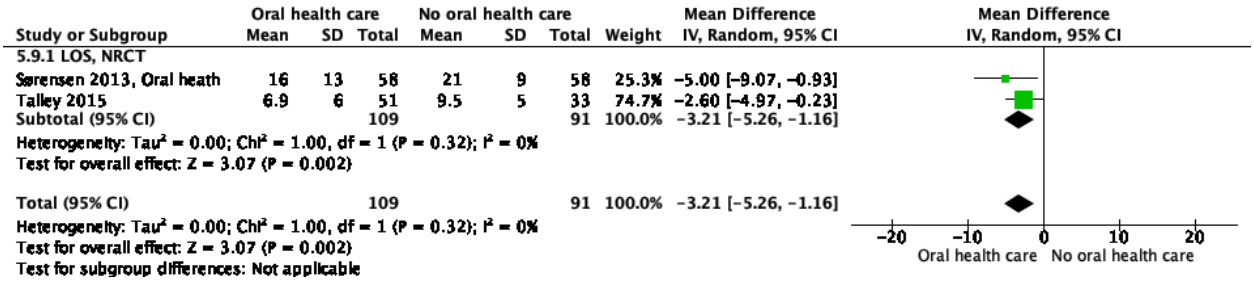


Table 5: Effect of oral health on outcomes in patients with dysphagia after stroke

Outcome	Incidence %		n (N)	OR [95% CI]	I^2	P value
	Oral health	Control				
AGNB isolated						
• RCT	6.8%	21.0%	1(203)	0.32 [0.14, 0.73]	NA	0.006
AGNB carriage						
• RCT	14.6%	16.0%	1(203)	0.91 [0.48, 1.74]	NA	0.78
Infections						
• RCT	3.9%	10.0%	1(203)	0.39 [0.13, 1.20]	NA	0.1
UTI						
• NRCT	44.8%	41.4%	1(116)	1.08 [0.71, 1.65]	NA	0.71

AGNB: Aerobic Gram-negative bacilli; CI: Confidence intervals; I^2: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; p: Statistical significance value; OR: Odds ratio

Figure 7: Effect of oral health on infections in patients with dysphagia after stroke

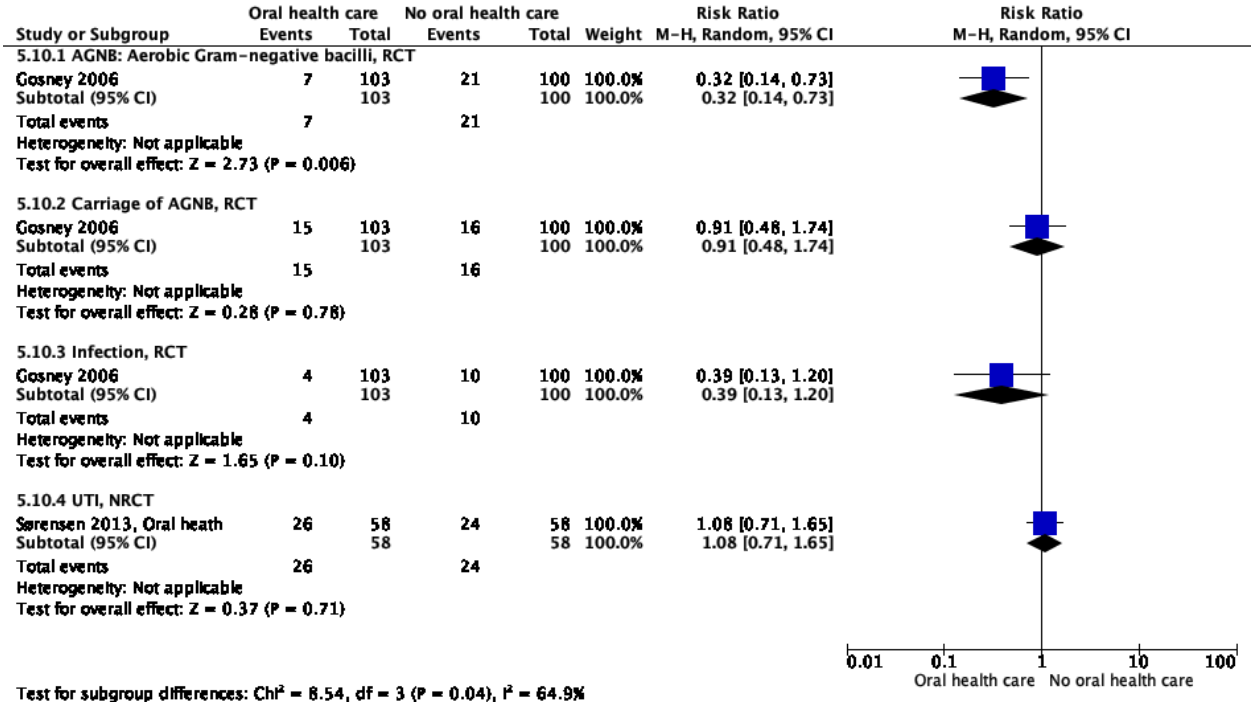
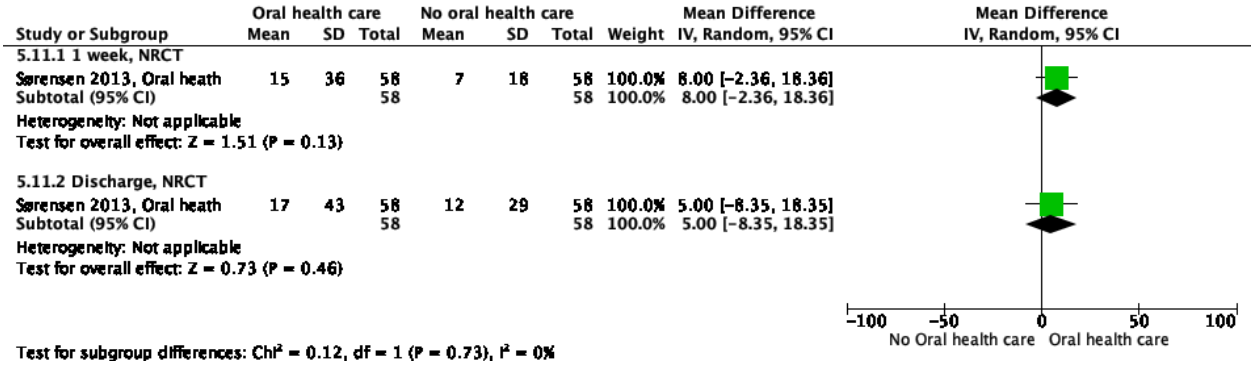


Table 6: Effect of oral health on oral index in patients with dysphagia after stroke

Outcome	Incidence % Mean±SD		n (N)	OR/ MD [95% CI]	I^2	P value
	Oral health	Control				
BI						
1 week						
• RCT	NR	NR	NR	NR	NR	NR
• NRCT	15±36	7±18	1(116)	8.00 [-2.36, 18.36]	NA	0.13
Discharge						
• RCT	NR	NR	NR	NR	NR	NR
• NRCT	17±43	12±29	1(116)	5.00 [-8.35, 18.35]	NA	0.46

CI: Confidence intervals; I^2: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; p: Statistical significance value; OR: Odds ratio; SD: Standard Deviation

Figure 8: Effect of oral health on BI in patients with dysphagia after stroke



Treatment 5 – Pharmacological Treatment

Table 1: Effect of drugs on mortality and pneumonia in patients with dysphagia after stroke

Outcome	Incidence %		n (N)	RR [95% CI]	I^2	P value
	Drugs	Control				
Mortality						
ACE inhibitors						
• Overall	10.3%	10.5%	4(6733)	0.96 [0.54, 1.69]	75%	0.88
• RCTs: vs Control	10.6%	11.0%	3(6244)	0.97 [0.46, 2.04]	83%	0.93
• NRCT: vs Control	4.8%	5.6%	1(489)	0.86 [0.37, 1.99]	NA	0.72
TRPV-agonists: RCT	0.0%	2.9%	1(70)	0.33 [0.01, 7.91]	NA	0.5
Dopaminergic drugs: RCT	15.2%	42.9%	1(68)	0.35 [0.14, 0.86]	NA	0.02
Antibiotics: RCTs	16.1%	15.3%	7(4301)	1.05 [0.87, 1.26]	16%	0.61
Metoclopramide: RCT	26.7%	40.0%	1(60)	0.67 [0.32, 1.39]	NA	0.28
Pneumonia						
ACE inhibitors						
• Overall	4.1%	7.6%	12(10611)	0.60 [0.51, 0.70]	61%	< 0.00001
• RCTs: Vs Control (Fatal)	4.4% (2.2%)	5.2% (2.2%)	2(6176) 2(6176)	0.86 [0.69, 1.06] (1.02 [0.74, 1.42])	61% (79%)	0.16 (0.89)
• NRCTs: Vs Control	3.6%	11.4%	4(1491)	0.41 [0.26, 0.64]	0%	< 0.0001
• NRCTs: vs other antihypertensives	3.9%	10.6%	6(2944)	0.38 [0.28, 0.52]	0%	< 0.00001
TRPV-agonists						
• Overall	9.6%	32.7%	2(104)	0.31 [0.15, 0.66]	0%	0.002
• RCT: Vs Control	0.0%	2.9%	1(70)	0.33 [0.01, 7.91]	NA	0.50
• NRCT: Vs Control	29.4%	94.1%	1(34)	0.31 [0.15, 0.66]	NA	0.002
Dopaminergic drugs: RCT	6.0%	27.5%	1(163)	0.22 [0.09, 0.55]	NA	0.001
Antibiotics: RCTs	10.3%	11.1%	6(4201)	0.93 [0.78, 1.10]	17%	0.40
Metoclopramide: RCT	26.7%	86.7%	1(60)	0.31 [0.17, 0.57]	NA	0.0002

ACE: Angiotensin converting enzyme; CI: Confidence intervals; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; NRCT: Non-Randomized Controlled Trial; p: Statistical significance value; RCT: Randomized Controlled Trial; RR: Risk ratio; TRPV: transient receptor potential vanilloid

Figure 1: Mortality with ACE inhibitors in patients with dysphagia after stroke

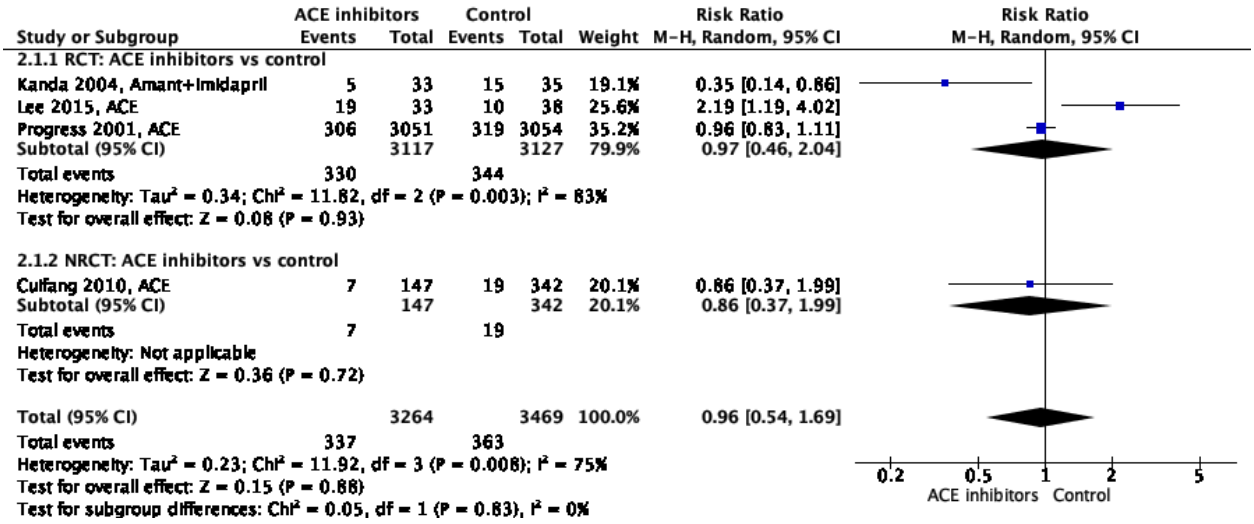


Figure 2: Mortality with TRPV-agonists, dopaminergic drugs, antibiotics and metoclopramide in patients with dysphagia after stroke

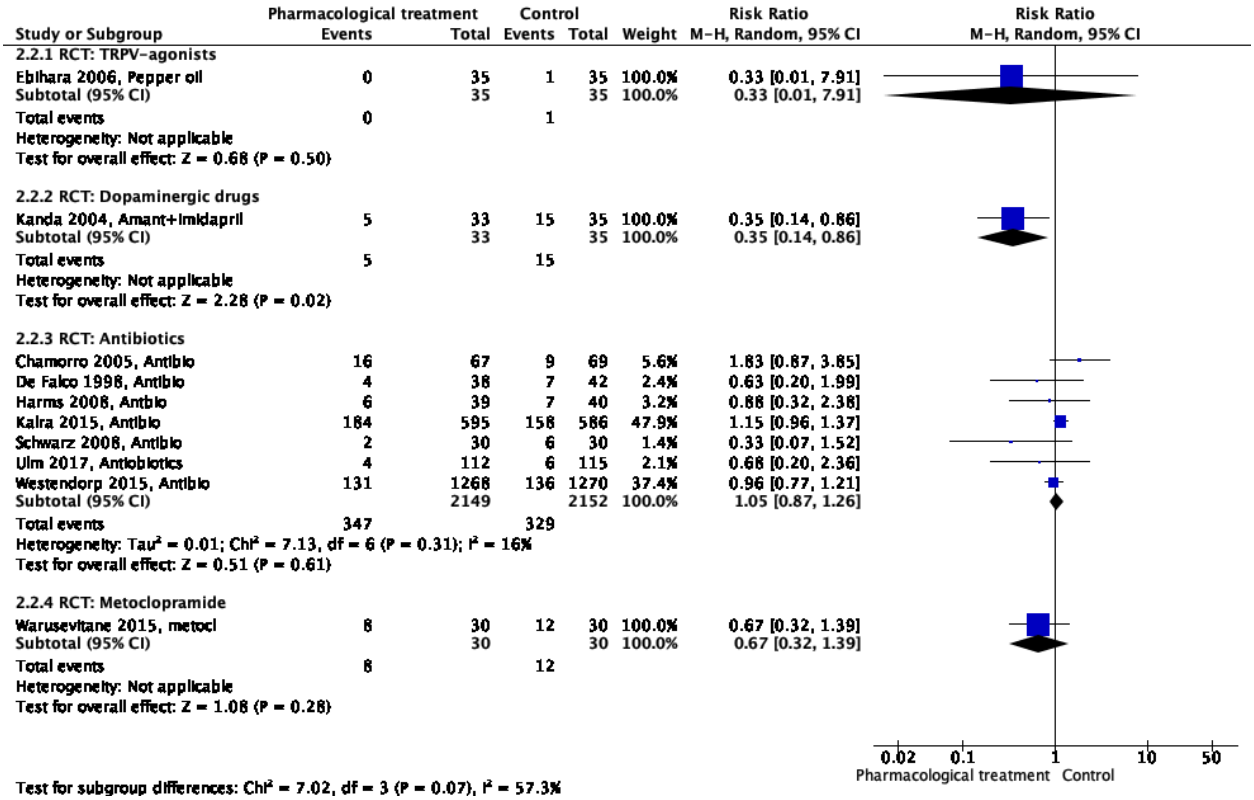


Figure 3: Pneumonia with ACE inhibitors in patients with dysphagia after stroke

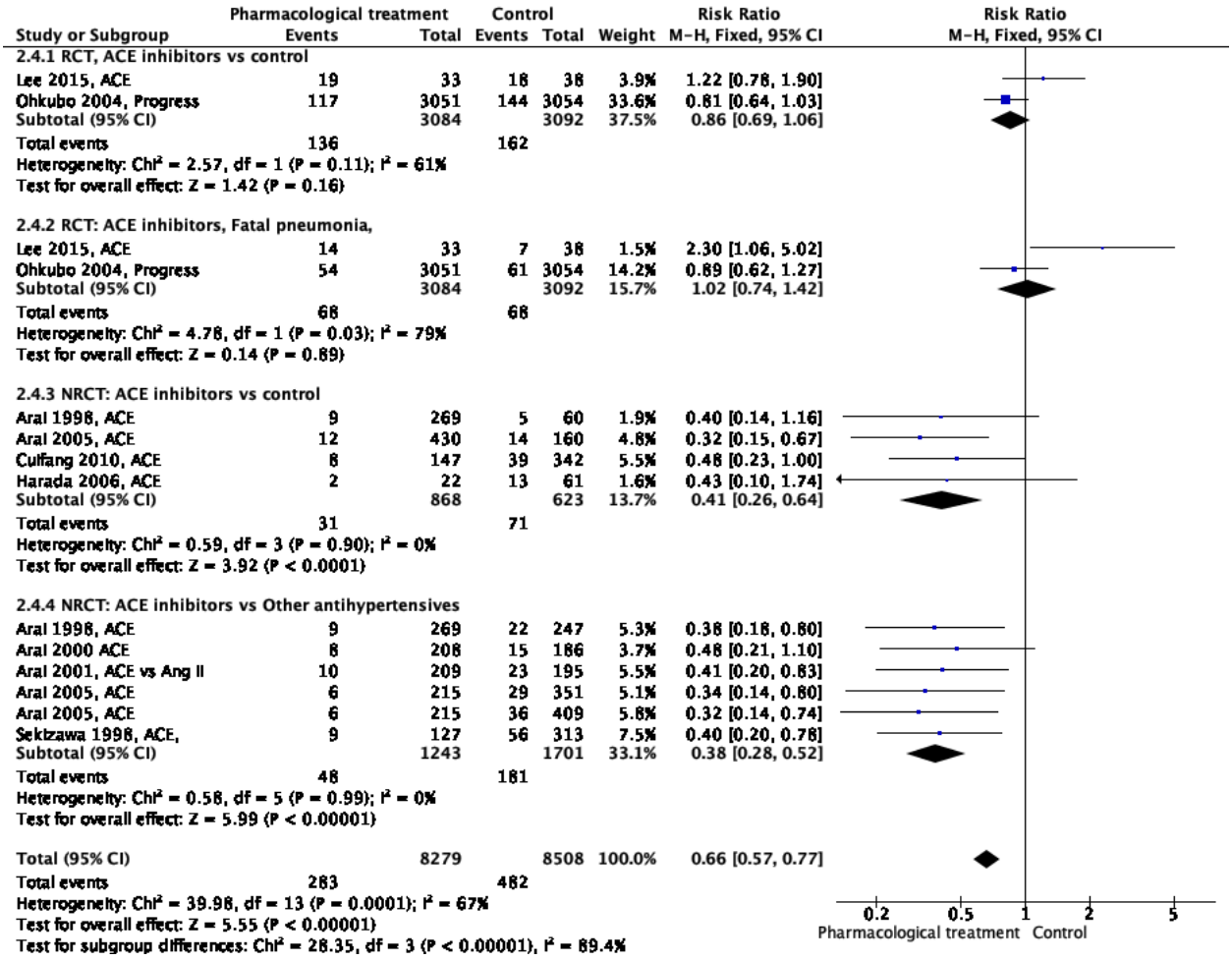


Figure 4: Pneumonia with TRPV-agonists in patients with dysphagia after stroke

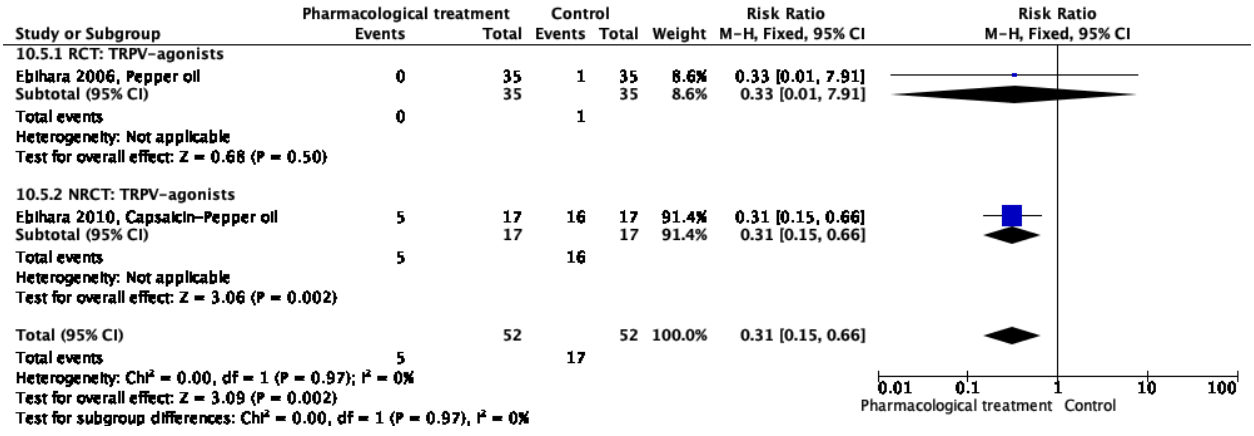
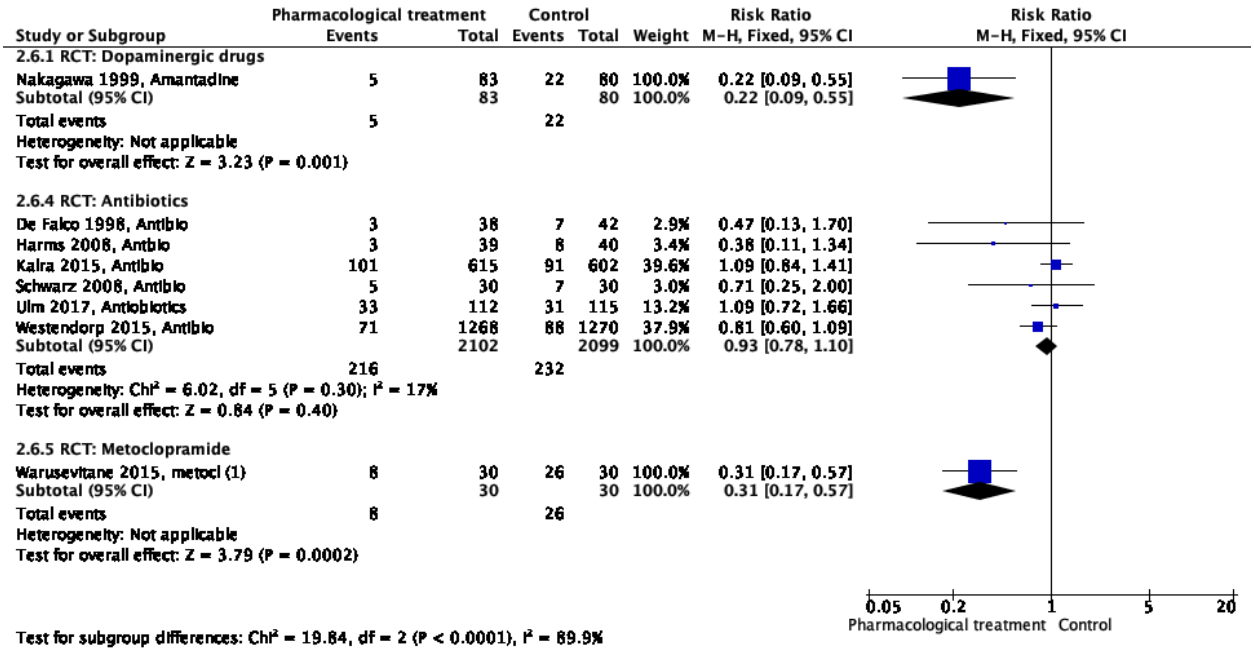


Figure 5: Pneumonia with dopaminergic drugs, antibiotics and metoclopramide in patients with dysphagia after stroke



Test for subgroup differences: Chi² = 19.84, df = 2 (P < 0.0001), I² = 89.9%

Footnotes

(1) Mean episodes: 0.27±0.45 vs 1.33±0.76

Table 2: Effect of antibiotics on mRS in patients with dysphagia after stroke

Outcome	Incidence %		n (N)	RR [95% CI]	I^2	P value
	Drugs	Control				
mRS						
• Antibiotics: RCTs						
• mRS 0, 1	8.8%	8.8%	2(1408)	1.80 [0.31, 10.34]	81%	0.51
• mRS 0-2	46.0%	45.4%	3(3946)	1.02 [0.83, 1.25]	56%	0.85
• mRS 3-6	43.3%	45.4%	3(2825)	0.97 [0.91, 1.02]	31%	0.25
• mRS 4-6	29.0%	30.3%	3(2825)	0.93 [0.85, 1.03]	2%	0.16

CI: Confidence intervals; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; p: Statistical significance value; RCT: Randomized Controlled Trial; RR: Risk ratio

Figure 6: mRS with antibiotics in patients with dysphagia after stroke

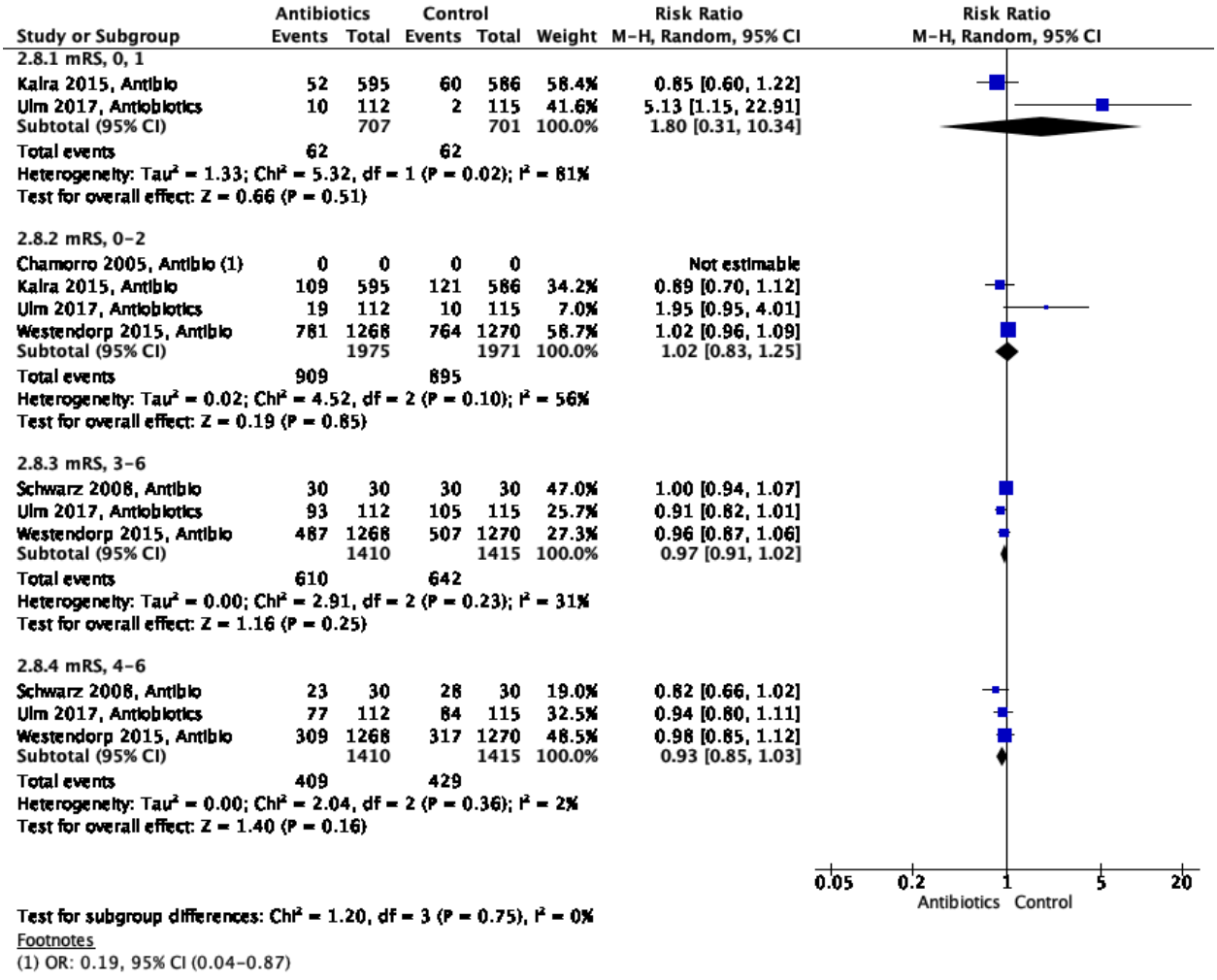


Table 3: Effect of drugs on tracheobronchitis and pneumothorax in patients with dysphagia after stroke

Outcome	Incidence %		n (N)	RR [95% CI]	I^2	P value
	Drugs	Control				
Tracheobronchitis						
• Antibiotics: RCT	6.7%	10.0%	1(60)	0.67 [0.12, 3.71]	NA	0.64
Pneumothorax						
• Antibiotics: RCT	0.0%	2.5%	1(79)	0.34 [0.01, 8.14]	NA	0.51

CI: Confidence intervals; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RCT: Randomized Controlled Trial; RR: Risk ratio

Figure 7: Chest complications with antibiotics in patients with dysphagia after stroke

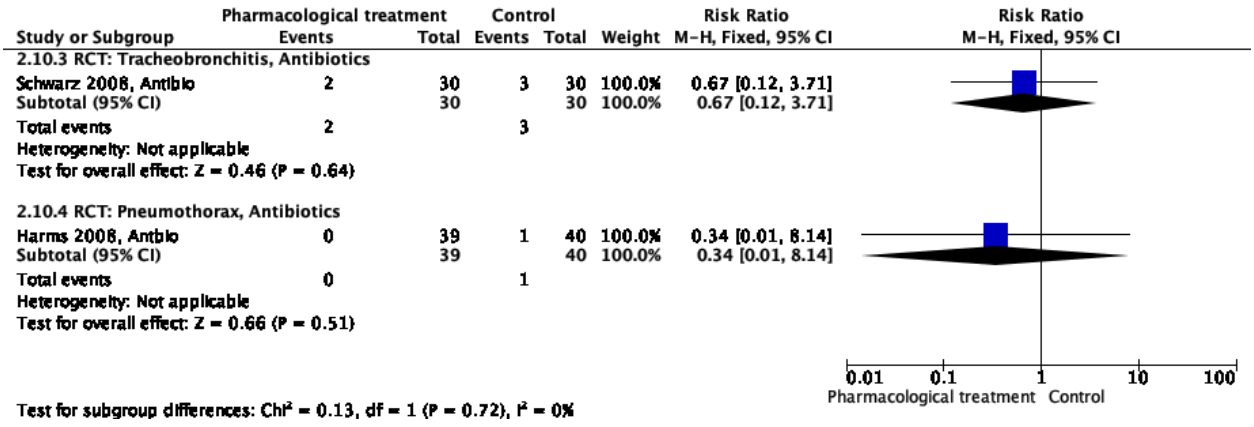


Table 4: Effect of drugs on stroke and TIA in patients with dysphagia after stroke

Outcome	Incidence %		n (N)	RR [95% CI]	I^2	P value
	Drugs	Control				
Stroke						
• ACE inhibitors: RCTs	9.0%	10.2%	2(26437)	0.84 [0.65, 1.08]	89%	0.16
• Antibiotics: RCTs	12.9%	13.7%	5(6599)	0.94 [0.84, 1.05]	0%	0.27
TIA						
• Antibiotics: RCT	6.5%	5.3%	1(2538)	1.23 [0.90, 1.68]	NA	0.2

ACE: Angiotensin converting enzyme; CI: Confidence intervals; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RCT: Randomized Controlled Trial; RR: Risk ratio; TIA: Transient ischemic attack

Figure 8: Stroke and TIA with ACE inhibitors and antibiotics in patients with dysphagia after stroke

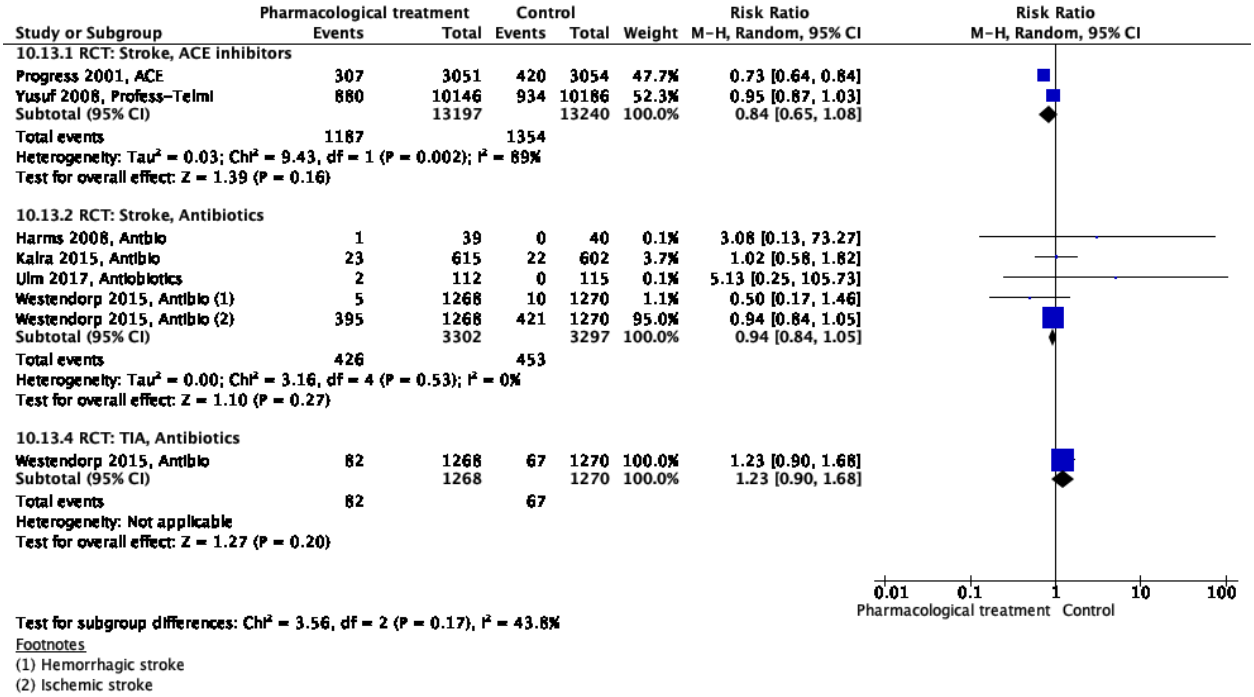


Table 5: Effect of drugs on infections in patients with dysphagia after stroke

Outcome	Incidence %		n (N)	RR [95% CI]	I^2	P value
	Drugs	Control				
Infections						
ACE inhibitors: RCT	12.1%	45.7%	1(68)	0.27 [0.10, 0.71]	NA	**0.**008
Dopaminergic drugs: RCT	12.1%	45.7%	1(68)	0.27 [0.10, 0.71]	NA	**0.**008
Antibiotics: RCTs	14.5%	20.8%	6(4090)	0.68 [0.54, 0.86]	52%	0.001
• Overall	15.3%	21.2%	7(4317)	0.73 [0.58, 0.92]	59%	0.007
• UTI	4.0%	9.6%	5(4121)	0.46 [0.32, 0.68]	40%	<0.0001
• E coli	5.1%	32.5%	1(79)	0.16 [0.04, 0.65]	NA	0.01
• C difficile	0.3%	0.7%	1(1217)	0.49 [0.09, 2.66]	NA	0.41
• MRSA	1.8%	2.3%	1(1217)	0.77 [0.35, 1.68]	NA	0.51
Metoclopramide: RCT	10.0%	36.7%	1(60)	0.27 [0.08, 0.88]	NA	**0.03**

ACE: Angiotensin converting enzyme; CI: Confidence intervals; I^2, p: Heterogeneity; MRSA: Methicillin-resistant Staphylococcus aureus; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RCT: Randomized Controlled Trial; RR: Risk ratio; UTI: Urinary tract infections

Figure 9: Infections with ACE inhibitors and dopaminergic drugs in patients with dysphagia after stroke

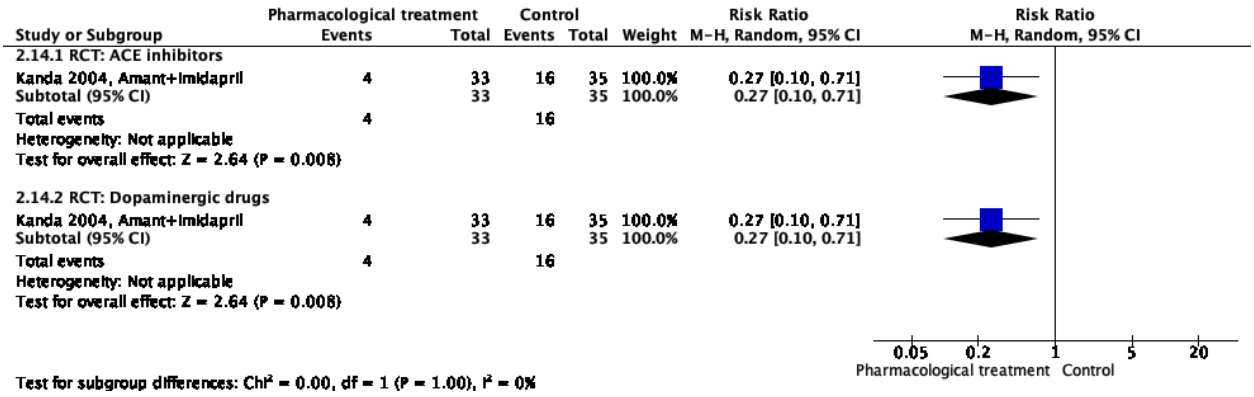


Figure 10: Various infections with antibiotics in patients with dysphagia after stroke

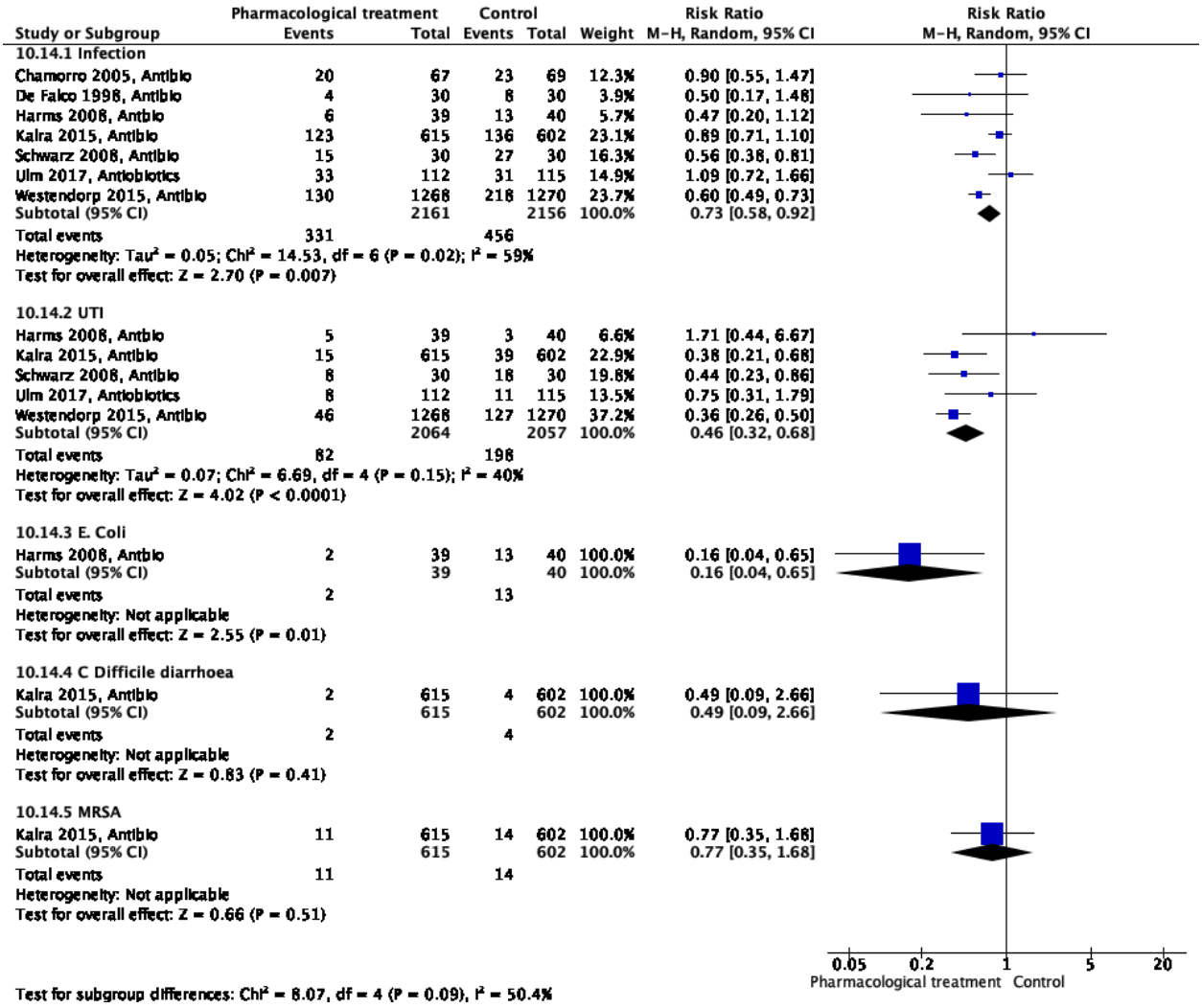


Figure 11: Infections with metoclopramide in patients with dysphagia after stroke

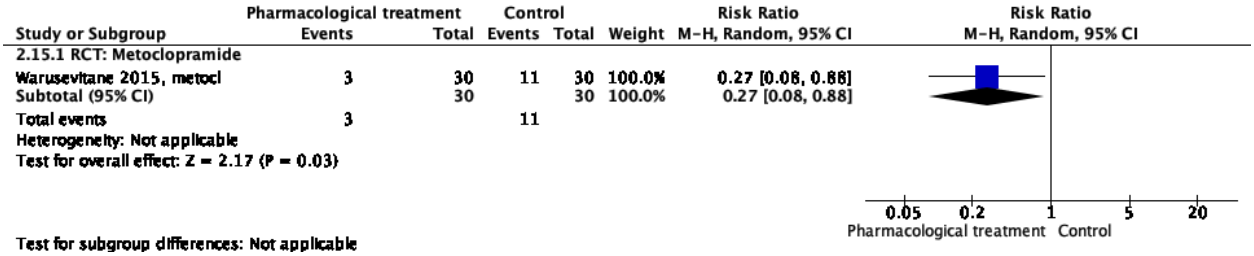


Table 6: Effect of drugs on composite outcomes in patients with dysphagia after stroke

Outcome	Incidence %		n (N)	RR [95% CI]	I^2	P value
	Drugs	Control				
Vascular death, Non-fatal MI, non-fatal stroke						
• ACE inhibitor, ARB: RCT	13.2%	15.0%	2(26437)	0.85 [0.69, 1.05]	90%	0.12
Vascular death, recurrent stroke, MI, or new or worsening heart failure						
• ARB: RCT	13.5%	14.4%	1(20332)	0.94 [0.88, 1.00]	NA	0.07

ARB: Angiotensin receptor blocker; ACE: Angiotensin converting enzyme; CI: Confidence intervals; I^2, p: Heterogeneity; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RCT: Randomized Controlled Trial; MI: Myocardial infarction; RR: Risk ratio

Figure 12: Composite outcomes (Vascular death, myocardial infarction, stroke or heart failure) in patients with dysphagia after stroke

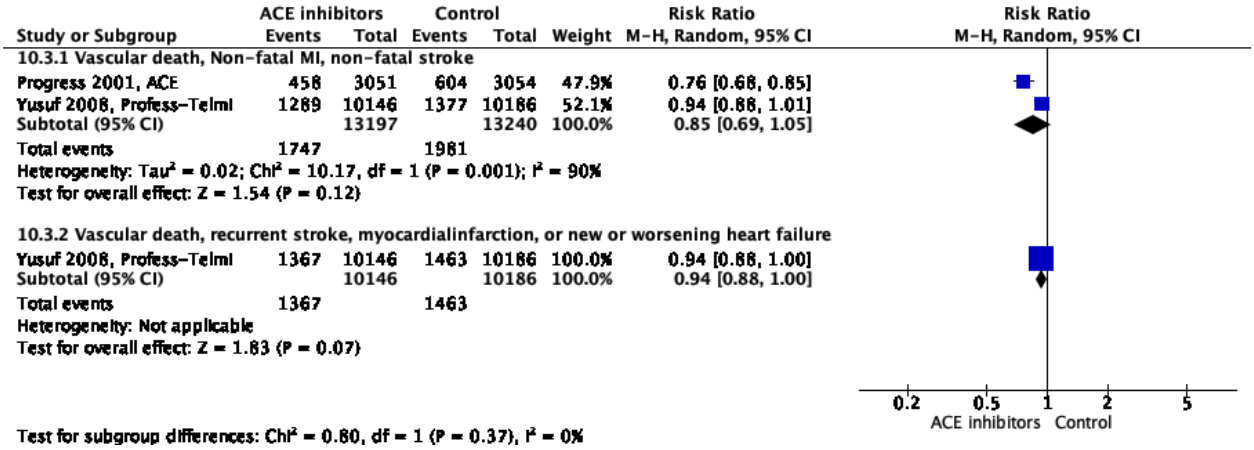


Table 7: Effect of drugs on complications in patients with dysphagia after stroke

Outcome	Incidence %		n (N)	RR [95% CI]	I^2	P value
	Drugs	Control				
Aberrant bolus movement						
• Levodopa: RCT	93.5%	98.0%	1(298)	0.95 [0.91, 1.00]	NA	0.05
Dorsal head compensation						
• Levodopa: RCT	93.0%	96.9%	1(298)	0.96 [0.91, 1.01]	NA	0.12
Abnormal posture						
• Levodopa: RCT	63.5%	68.4%	1(298)	0.93 [0.78, 1.10]	NA	0.40
Bleeding, intracranial						
• Antibiotics: RCT	2.3%	2.0%	1(1217)	1.14 [0.53, 2.45]	NA	0.73
Bleeding GIT						
• Antibiotics: RCT	0.8%	1.0%	1(1217)	0.82 [0.25, 2.66]	NA	0.74
Transfer to ICU						
• Antibiotics: RCT	1.0%	0.7%	1217	1.47 [0.42, 5.18]	NA	0.55

CI: Confidence intervals; I^2, p: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RCT: Randomized Controlled Trial; RR: Risk ratio

Figure 13: Bolus movement, dorsal head compensation and abnormal posture in patients with dysphagia after stroke

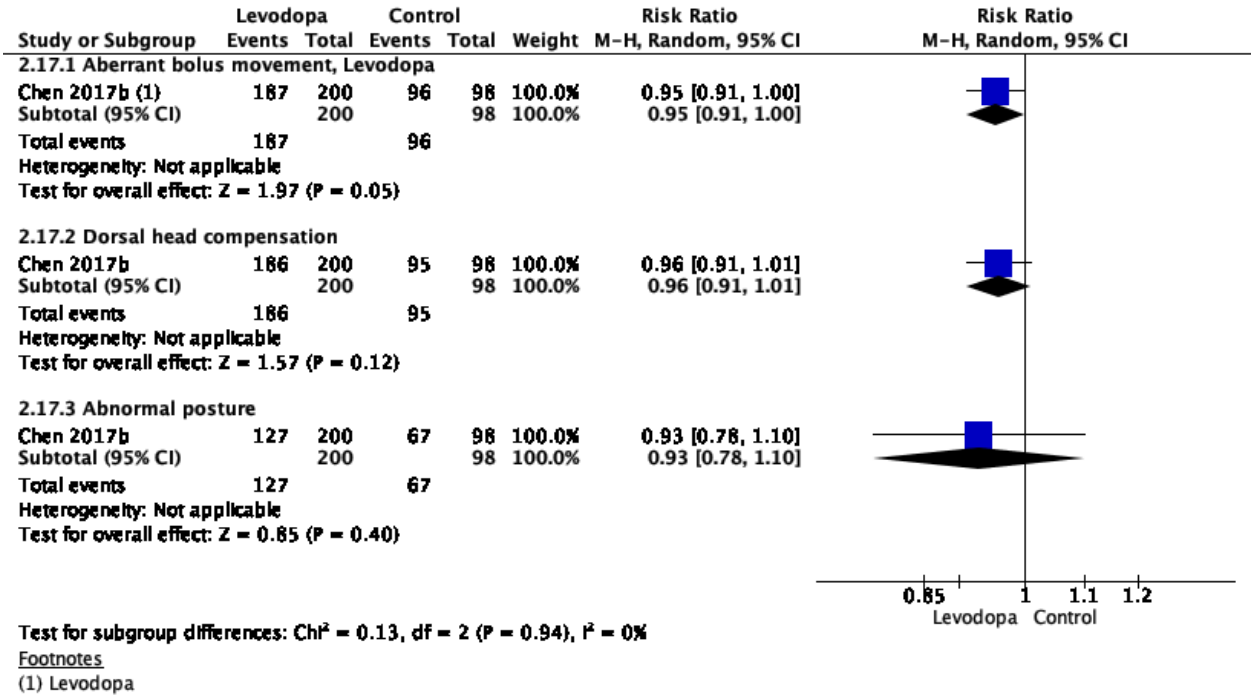


Figure 14: Bleeding and transfer of patients (of stroke with dysphagia) to intensive care unit

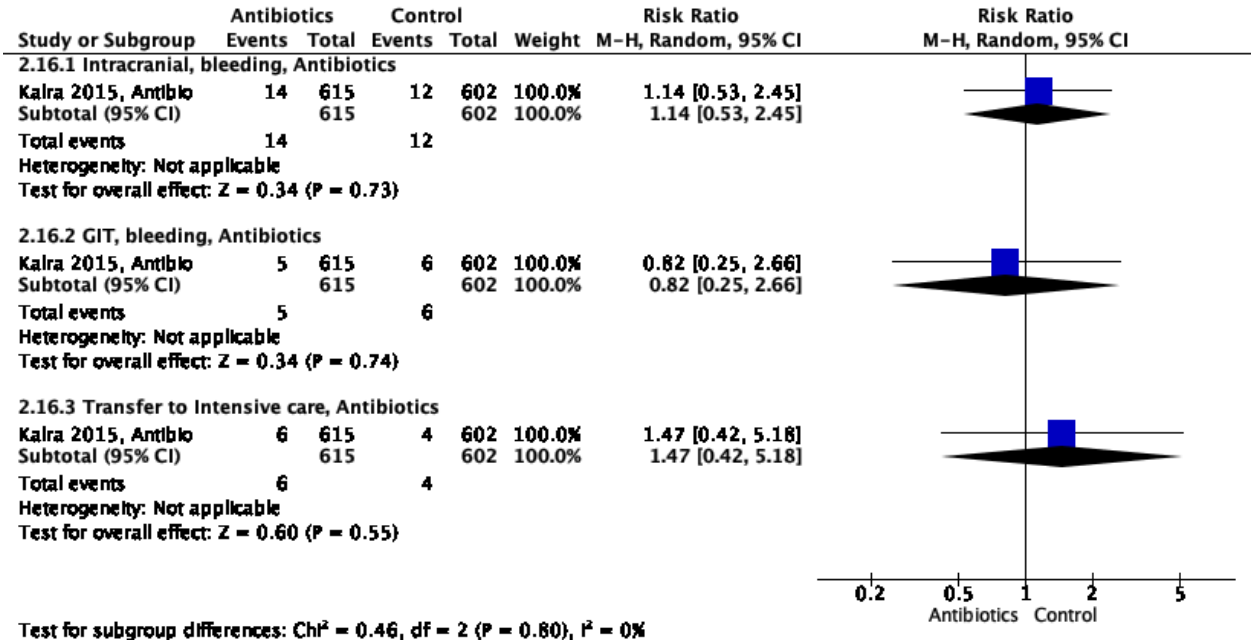


Table 8: Effect of drugs on dysphagia score, swallowing and referred to PEG in patients with dysphagia after stroke

Outcome	Incidence % Mean±SD		n (N)	RR [95% CI]/ MD [95% CI]	I^2	P value
	Drugs	Control				
RBHOMS						
ACE inhibitors: RCT						
• Change	0.5±1.5	0.6±1.5	1(48)	-0.10 [-0.96, 0.76]	NA	0.82
• Post intervention	4.2±1.5	3.5±1.5	1(48)	0.70 [-0.16, 1.56]	NA	0.11
PAS						
TRPV agonists: NRCT						
• Post intervention	1.9±0.3	2.7±0.4	1(40)	-0.61 [-0.76, -0.45]	98%	0.22
Improvement in swallowing						
Metoclopramide: RCT	66.7%	36.7%	1(60)	1.82 [1.07, 3.10]	NA	**0.03**
Referred to PEG						
Metoclopramide; RCT	23.3%	40.0%	1(60)	0.58 [0.27, 1.28]	NA	0.18

a: Standard Mean Difference; ACE: Angiotensin converting enzyme; CI: Confidence intervals; I^2, p: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RBHOMS: Royal Brisbane Hospital Outcome; RR: Risk ratio; SD: Standard Deviation; TRPV: transient receptor potential vanilloid

Figure 15: RBHOMS: Royal Brisbane Hospital Outcome in patients with dysphagia after stroke

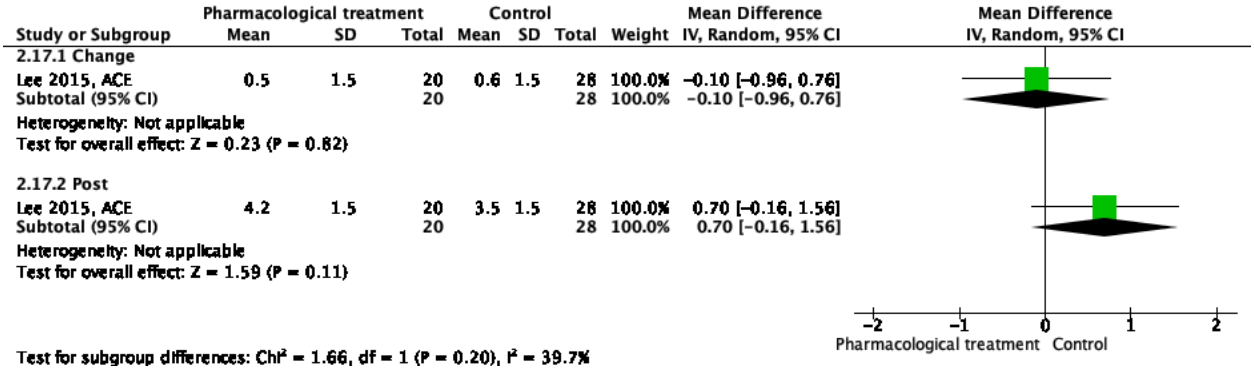


Fig 16: PAS with capsaicin in patients with dysphagia after stroke

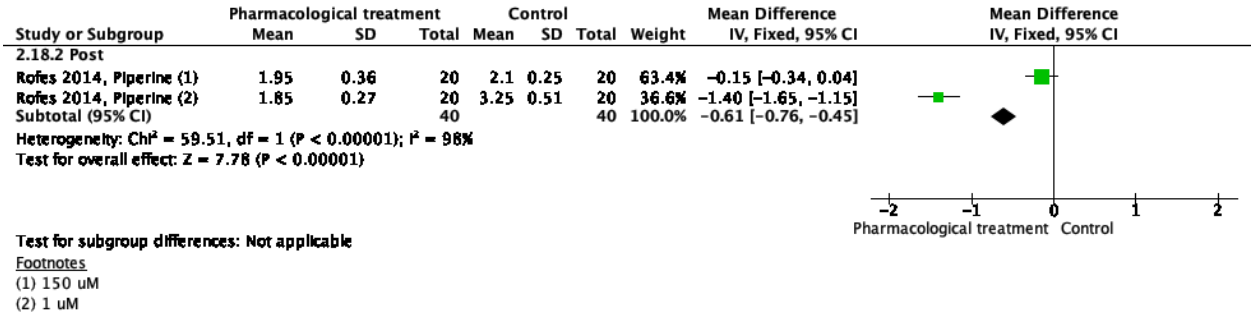


Figure 17: Improvement in swallowing with metoclopramide in patients with dysphagia after stroke

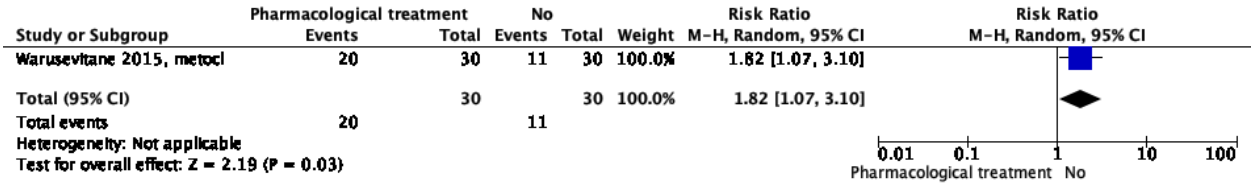


Figure 18: Referred to PEG with metoclopramide in patients with dysphagia after stroke

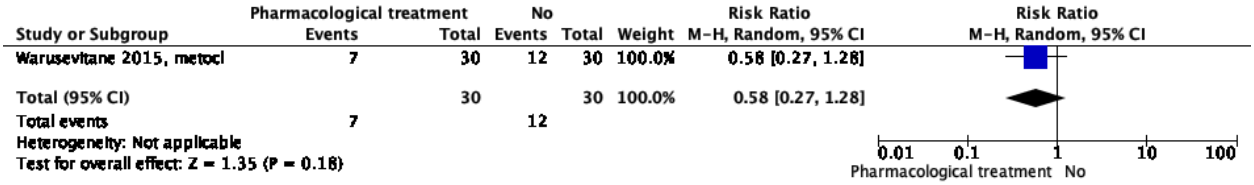


Table 9: Effect of drugs on cough reflex, substance P levels in patients with dysphagia after stroke

Outcome	Incidence, % Mean±SD		n (N)	RR [95% CI]/ MD [95% CI]	I^2	P value
	Drugs	Control				
Cough reflex sensitivity, log mg/mL						
TRPV agonists						
• Overall	1.1±0.3	1.2±0.3	2(98)	-0.10 [-0.15, -0.05]	0%	<0.0001
• RCT	1.3±0.1	1.4±0.1	1(64)	-0.10 [-0.15, -0.05]	NA	<0.0001
• NRCT	0.8±0.6	0.9±0.8	1(34)	-0.10 [-0.58, 0.38]	NA	0.68
Cough						
Dopaminergic drugs: RCT	56.0%	55.1%	1(298)	1.02 [0.82, 1.26]	NA	0.88
Substance P levels						
ACE inhibitors						
• Change from baseline						
○ Overall	39.2±6.9	-2.0±1.0	3(80)	39.12 [23.30, 54.95]	98%	<0.00001
○ RCT	36.6±6.7	-1.1±1.1	2(54)	32.12 [8.79, 55.44]	99%	0.007
○ NRCT	50.5±8.0	-2.7±1.0	1(26)	53.20 [48.22, 58.18]	NA	<0.00001
• Post intervention						
○ Overall	65.3±6.9	24.2±1.0	3(80)	38.99 [23.26, 54.72]	98%	<0.00001
○ RCT	62.7±6.7	25.3±1.1	2(54)	31.92 [8.99, 54.85]	98%	0.006
○ NRCT	76.5±8.0	23.3±1.0	1(26)	53.20 [48.22, 58.18]	NA	<0.00001
TRPV agonist						
• Change from baseline, RCT	5.5±10.6	-3.4±8.7	1(70)	8.90 [4.36, 13.44]	NA	0.00001
• Post intervention from baseline, RCT	40.8±10.6	30.9±8.7	1(70)	9.90 [5.36, 14.44]	NA	<0.0001

ACE: Angiotensin converting enzyme; CI: Confidence intervals; I^2, p: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RR: Risk ratio; SD: Standard Deviation; TRPV: transient receptor potential vanilloid

Fig 19: Cough reflex sensitivity, log mg/mL in patients with dysphagia after stroke

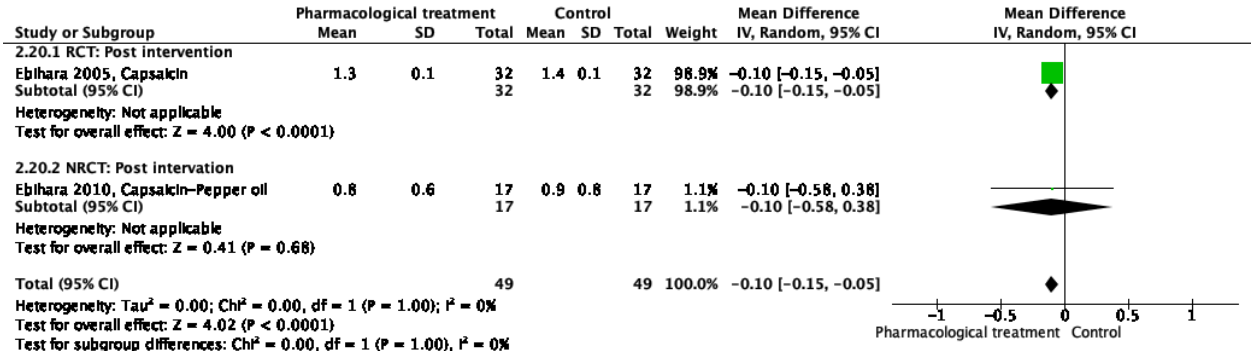


Fig 20: Substance P levels with ACE inhibitors in patients with dysphagia after stroke

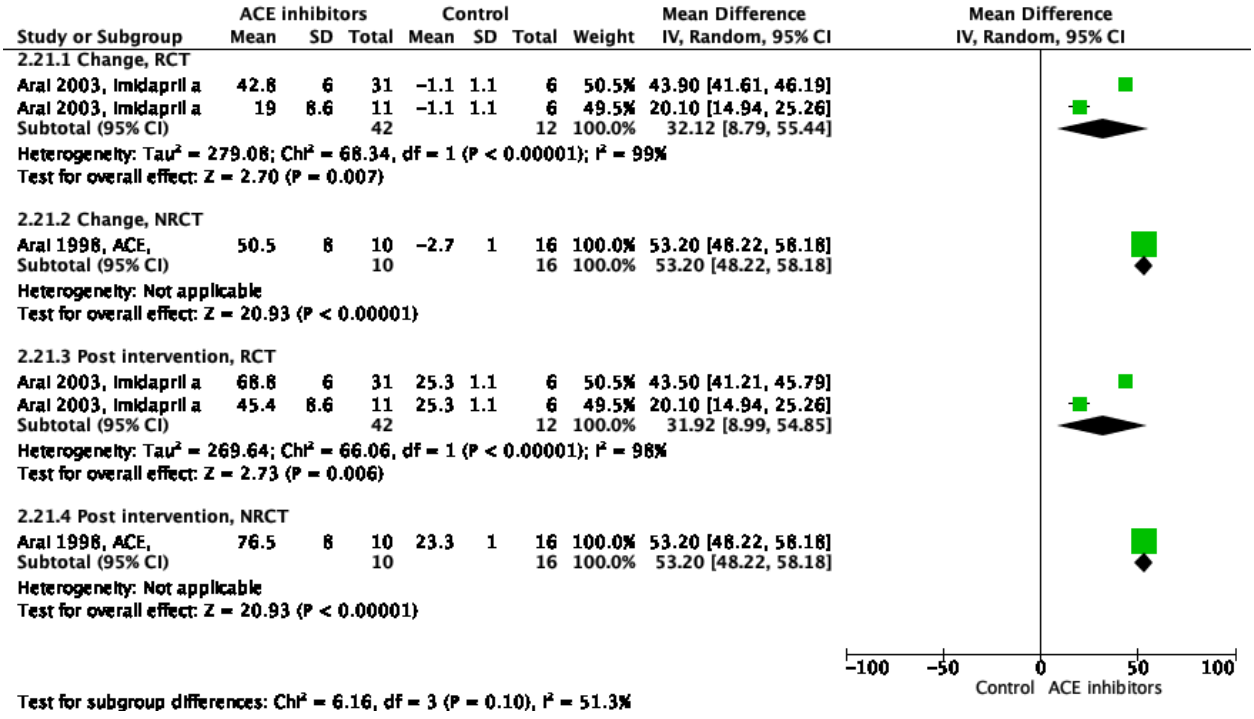


Fig 21: Cough with dopaminergic drugs in patients with dysphagia after stroke

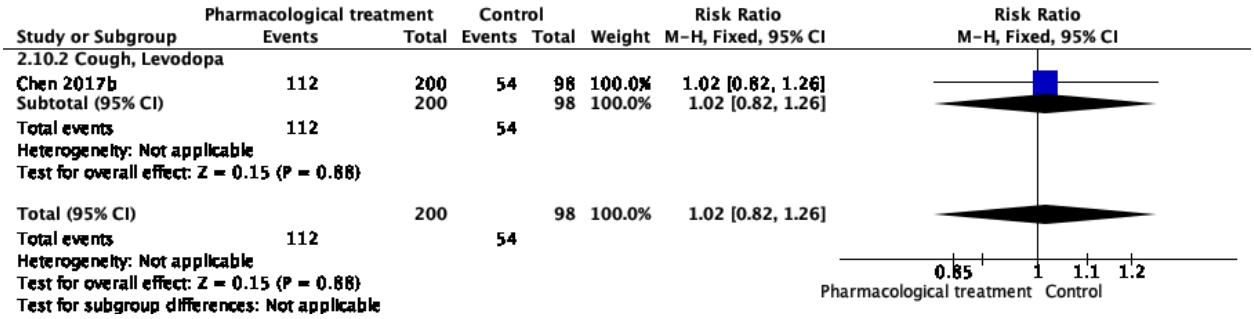


Fig 22: Substance P levels with TRPV agonist in patients with dysphagia after stroke

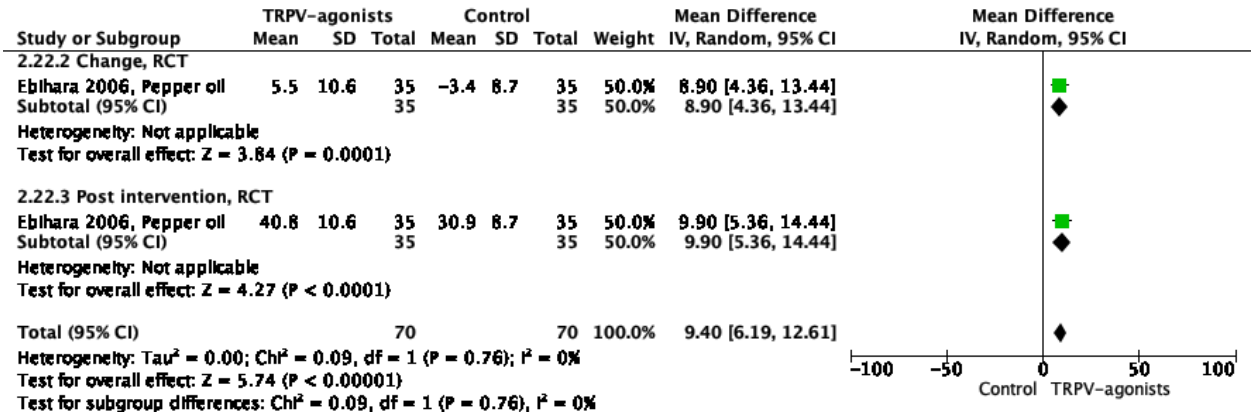


Table 10: Effect of drugs on NIHSS, Mini-mental state examination, quality of life, anxiety and depression in patients with dysphagia after stroke

Outcome	Incidence % Mean±SD		n (N)	RR [95% CI]/ MD [95% CI]	I^2	P value
	Drugs	Control				
NIHSS						
• Antibiotics: RCT	11.7±8.1	10.1±7.7	1(1217)	1.60 [0.71, 2.49]	NA	0.0004
Mini-mental state examination						
• TRPV agonist: RCT	11.2±7.7	12.4±7.3	1(70)	-1.20 [-4.72, 2.32]	NA	0.50
EUR, Quality of life						
Problem with mobility						
• Antibiotics: RCT	70.3%	69.2%	1(839)	1.02 [0.93, 1.11]	NA	0.72
Problem with selfcare						
• Antibiotics: RCT	71.0%	69.9%	1(839)	1.02 [0.93, 1.11]	NA	0.71
Problem with usual activities						
• Antibiotics: RCT	85.3%	85.8%	1(833)	0.99 [0.94, 1.05]	NA	0.83
Pain or discomfort						
• Antibiotics: RCT	53.6%	49.5%	1(823)	1.08 [0.95, 1.24]	NA	0.24
Anxiety or depression						
• Antibiotics: RCT	53.0%	51.6%	1(813)	1.03 [0.90, 1.17]	NA	0.68

CI: Confidence intervals; I^2, p: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RR: Risk ratio; SD: Standard Deviation

Figure 23: NIHSS, Mini mental state examination, number of swallows per min in patients with dysphagia after stroke

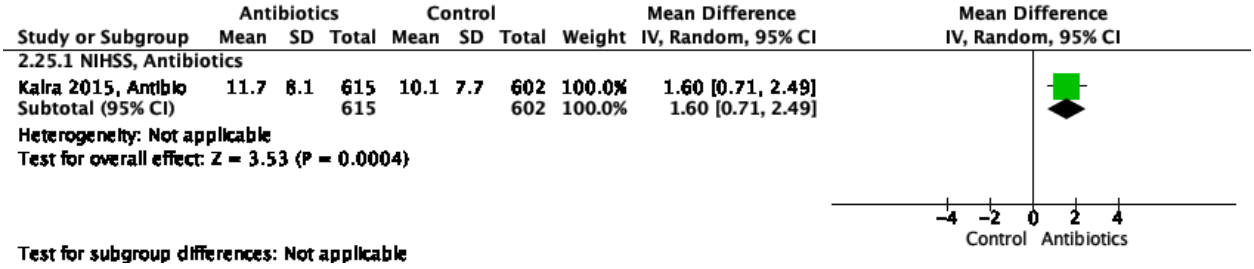


Fig 24: Mini-mental state examination in patients with dysphagia after stroke

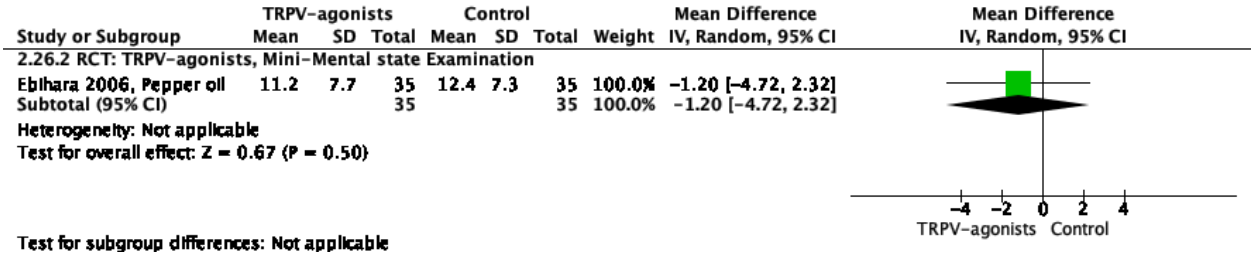


Fig 25: EUR QoL, anxiety and depression with the use of antibiotics in patients with dysphagia after stroke

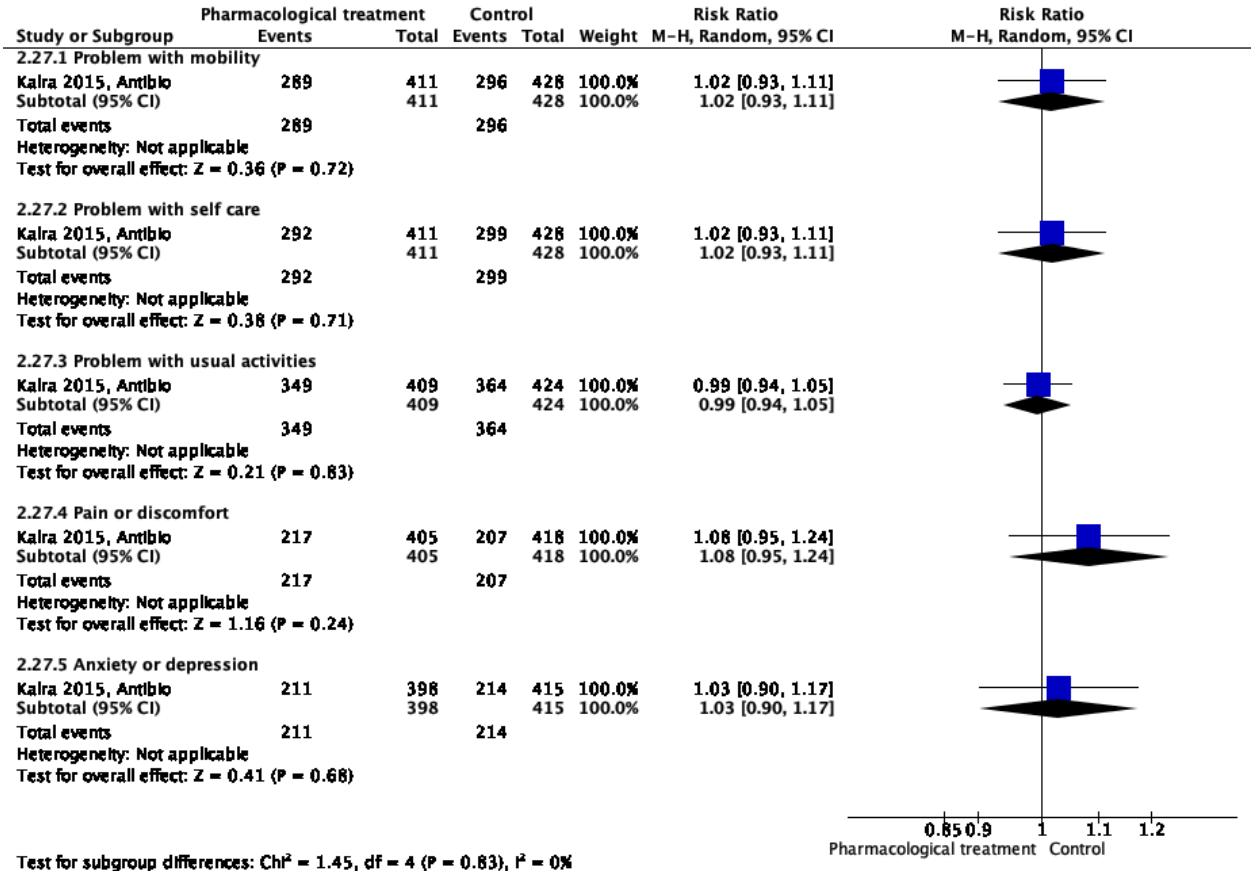


Table 11: Effect of drugs on length of stay, time to infection and number of febrile days in patients with dysphagia after stroke

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Drugs	Control				
Length of stay in hospital, days						
• ACE inhibitor: RCT	37±22	51±36	1(68)	-14.00 [-28.09, 0.09]	NA	0.05
• Dopaminergic: RCT	37±22	51±36	1(68)	-14.00 [-28.09, 0.09]	NA	0.05
• Antibiotics: RCT	12.5±5.9	10.2±5.8	2(3755)	3.49 [-3.37, 10.35]	100%	0.32
Time to first infection						
• Antibiotics: RCT	3.9±3.7	3.6±3.1	2(196)	0.76 [-1.30, 2.82]	81%	0.47
Number of febrile days						
• TRPV agonist: NRCT	1.3±1.7	6.8±4.7	1(34)	-5.50 [-7.88, -3.12]	NA	<0.00001

ACE: Angiotensin converting enzyme; CI: Confidence intervals; I^2, p: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; SD: Standard deviation; TRPV: transient receptor potential vanilloid

Fig 26: Length of stay in hospital in patients with dysphagia after stroke

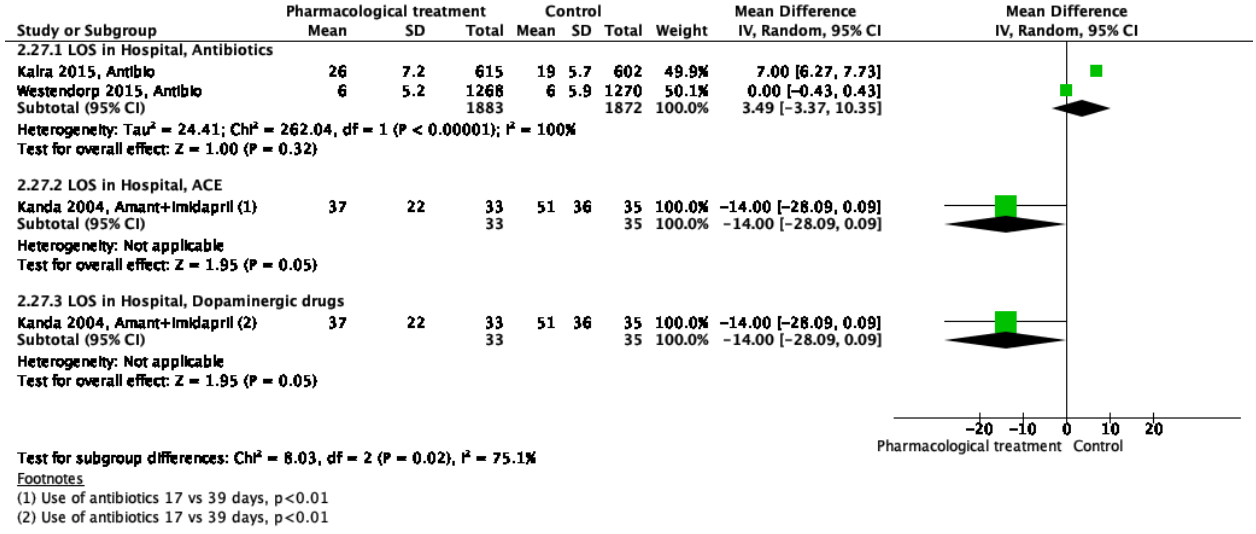


Fig 27: Time to first infection in patients with dysphagia after stroke

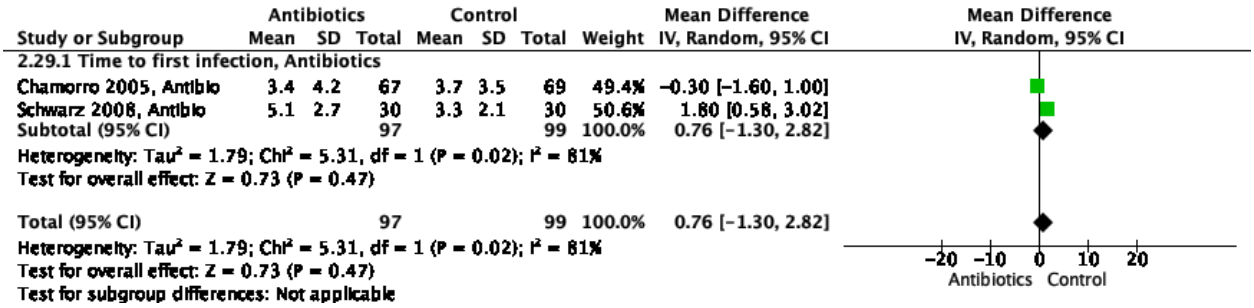


Fig 28: Number of febrile days in patients with dysphagia after stroke

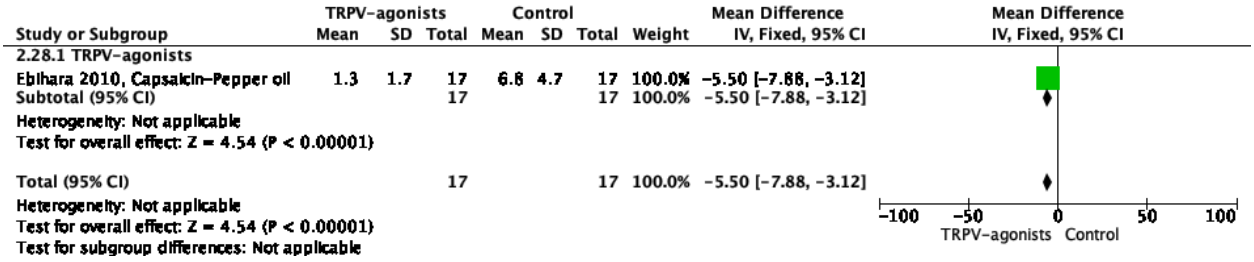


Table 12: Effect of drugs on length of stay and timing of swallowing in patients with dysphagia after stroke

Outcome	Incidence % Mean±SD		n (N)	RR [95% CI]/ MD [95% CI]	I^2	P value
	Drugs	**Control**				
Aspiration						
ACE inhibitors: RCT	26.2%	91.7%	1(54)	0.29 [0.17, 0.49]	NA	<0.00001
Dopaminergic drugs: RCT	25.9%	91.7%	1(39)	0.30 [0.16, 0.58]	0%	0.0003
Latency of swallowing reflex						
TRPV agonist						
• Change						
○ Overall	-7.4±1.2	-0.5±7.2	3(174)	-5.14 [-7.86, -2.41]	100%	0.80
○ RCT	-7.9±1.5	-0.6±9.4	2(134)	-6.68 [-15.75, 2.39]	90%	0.15
○ NRCT	-5.5±0.0	0.0±0.01	1(40)	-5.50 [-5.50, -5.50]	NA	<0.00001
• Post intervention						
○ Overall	7.3±6.0	12.0±12.2	3(168)	-4.54 [-10.86, 1.77]	72%	0.16
○ RCT	4.0±1.5	10.2±9.4	2(134)	-5.54 [-13.11, 2.02]	86%	0.15
○ NRCT	20.6±23.9	18.9±23.4	1(34)	1.70 [-14.20, 17.60]	NA	0.83
Upper oesophageal sphincter opening time, sec						
• TRPV agonist	0.9±0.1	1.0±0.0	2(50)	-0.08 [-0.13, -0.04]	41%	0.0002
Laryngeal vestibule closure time, sec						
• TRPV agonist	0.3±0.0	0.4±0.0	3(116)	-0.10 [-0.12, -0.08]	70%	<0.00001
Hyoid bone maximum anterior extension time, sec						
• TRPV agonist	0.5±0.0	0.6±0.1	3(146)	-0.15 [-0.16, -0.13]	0%	<0.00001
Bolus velocity						
• TRPV agonist	0.3±0.0	0.3±0.0	3(146)	0.04 [0.01, 0.08]	96%	0.02
Swallowing reflex (sec)						
• Dopaminergic drugs:	2.9±0.8	8.3±1.2	1(54)	-5.40 [-5.94, -	NA	<0.00001

Outcome	Incidence % Mean±SD		n (N)	RR [95% CI]/ MD [95% CI]	I^2	P value
	Drugs	Control				
RCT				4.86]		
Swallows/min						
• TRPV agonist						
• Change: RCT	3.3±2.5	0.0±0.05	1(70)	3.30 [2.47, 4.13]	NA	<0.00001
• Post intervention: RCT	3.7±2.5	0.5±0.5	1(70)	3.20 [2.36, 4.04]	NA	<0.00001

a: Standard Mean Difference; ACE: Angiotensin converting enzyme: CI: Confidence intervals; I^2, p: Heterogeneity; MD: Mean difference; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; RR: Risk ratio; TRPV: transient receptor potential vanilloid

Figure 29: Aspiration with ACE inhibitors and dopaminergic drugs in patients with dysphagia after stroke

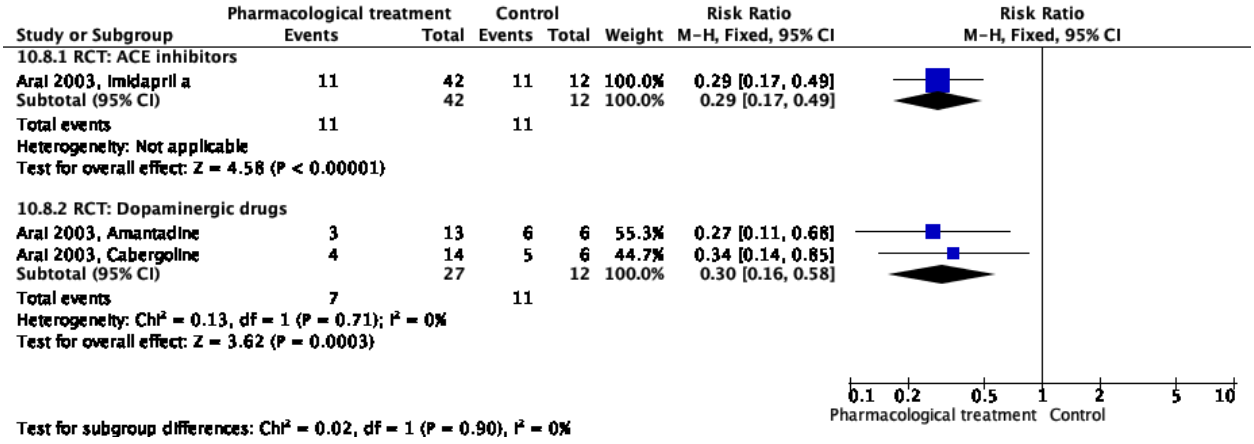
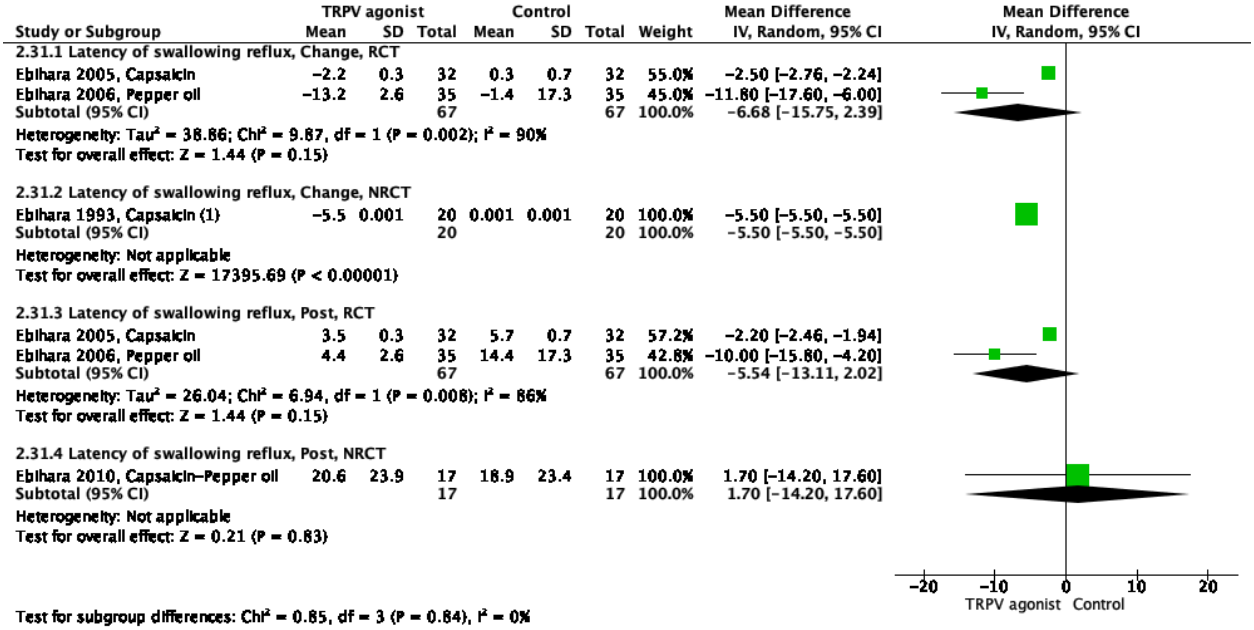


Figure 30: Latency of swallowing reflex with TRPV agonist in patients with dysphagia after stroke

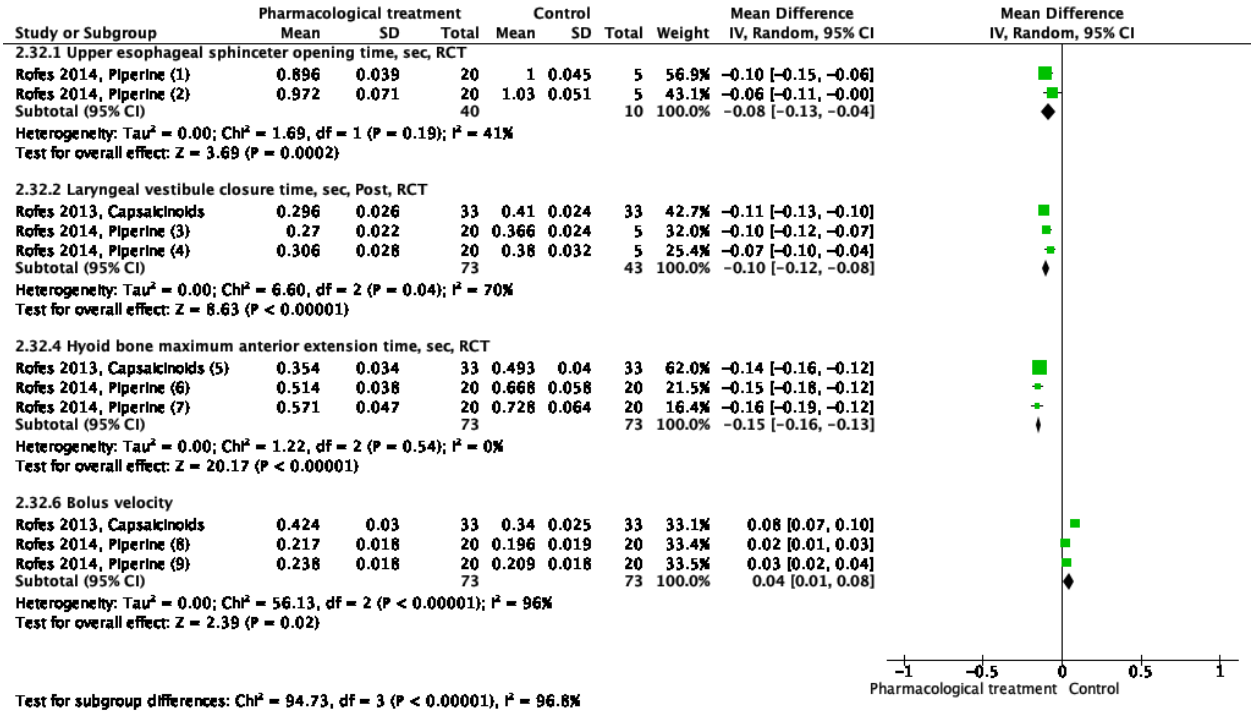


Test for subgroup differences: Chi² = 0.85, df = 3 (P = 0.84), I² = 0%

Footnotes

(1) Before after

Fig 31: Effect of TRPV on swallow timing in patients with dysphagia after stroke



Test for subgroup differences: Chi² = 94.73, df = 3 (P < 0.00001), I² = 96.8%

Footnotes

(1) 150 uM
(2) 150 uM
(3) 150 uM
(4) 150 uM
(5) Vertical movement
(6) 150 uM
(7) 150 uM
(8) 150 uM
(9) 150 uM

Fig 32: Latency of swallowing reflex (sec) in patients with dysphagia after stroke

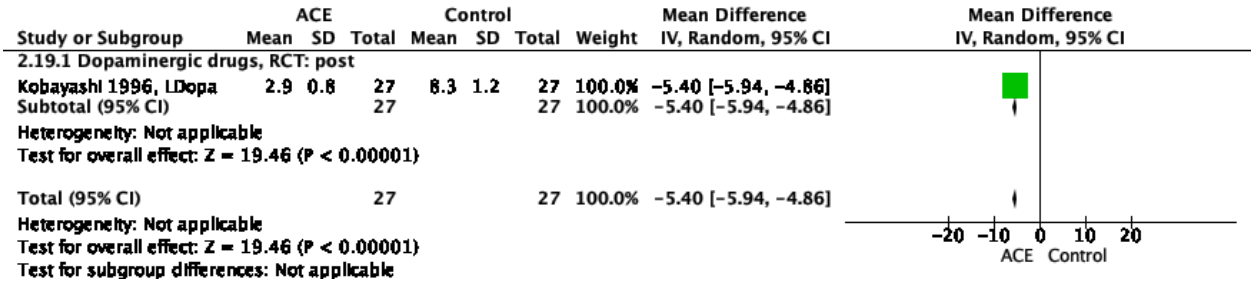
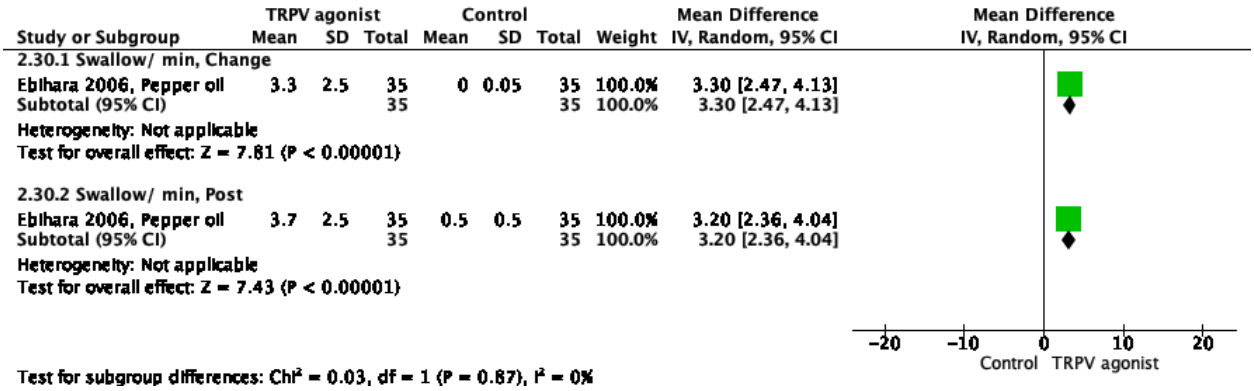


Fig 33: Swallow per min with TRPV agonist in patients with dysphagia after stroke



Treatment 6 - Neurostimulation

Table 1: Effect of stimulation on dysphagia score in patients with dysphagia after stroke

Outcome	Mean±SD		n (N)	SMD [95% CI]	I^2	P value
	Stimulation	Control				
Improvement in dysphagia score						
TES						
• Overall	5.8±2.7	3.5±2.6	22(868)	0.90 [0.62, 1.18]	69%	<0.00001
• RCT	6.2±2.8	3.7±2.7	19(746)	0.90 [0.60, 1.19]	70%	<0.00001
• NRCT	3.7±1.9	1.8±1.9	3(122)	1.14 [-0.13, 2.41]	78%	0.08
rTMS						
• Overall	9.6±6.1	4.7±5.1	11(236)	1.33 [0.51, 2.16]	85%	0.002
• RCT	10.5±6.4	5.3±5.5	10(212)	1.51 [0.60, 2.42]	85%	0.001
• NRCT	0.8±2.6	0.7±2.5	1(24)	0.04 [-0.76, 0.84]	NA	0.93
tDCS						
• Overall	2.8±2.3	2.0±1.8	8(196)	0.75 [0.38, 1.12]	26%	<0.0001
• RCT	2.8±2.3	2.0±1.8	8(196)	0.75 [0.38, 1.12]	26%	<0.0001
PES, Non-tracheostomized						
• Overall	2.3±1.9	1.6±2.2	5(204)	0.77 [-0.06, 1.60]	80%	0.07
• RCT	2.3±1.9	1.6±2.2	5(204)	0.77 [-0.06, 1.60]	80%	0.07
PES, tracheostomized						
• Overall	5.6±3.9	5.2±4.3	2(83)	0.25 [-0.19, 0.69]	0%	0.27
• RCT	5.6±3.9	5.2±4.3	2(83)	0.25 [-0.19, 0.69]	0%	0.27
Post-intervention dysphagia score						
TES						
• Overall	8.2±2.8	12.1±3.1	21(869)	-1.03 [-1.41, -0.66]	83%	<0.00001
• RCT	9.2±3.0	12.6±3.2	19(759)	-1.00 [-1.37, -0.63]	80%	<0.00001
• NRCT	2.9±1.8	6.6±2.1	2(110)	-1.16 [-3.50, 1.18]	94%	0.33
rTMS						
• Overall	14.5±6.3	16.2±5.5	11(232)	-1.71 [-2.75, -0.66]	89%	0.001
• RCT	15.7±6.7	18.1±5.9	10(208)	-1.96 [-3.14, -0.78]	90%	0.001
• NRCT	2.5±2.6	2.6±2.5	1(24)	-0.04 [-0.84, 0.76]	NA	0.93
tDCS						
• Overall	3.7±3.2	5.4±3.7	4(122)	-0.29 [-0.92, 0.33]	61%	0.36
• RCT	3.7±3.2	5.4±3.7	4(122)	-0.29 [-0.92, 0.33]	61%	0.36
PES, Non-tracheostomized						
• Overall	3.9±3.0	4.8±3.0	4(201)	-0.22 [-0.70, 0.25]	49%	0.35
• RCT	3.9±3.0	4.8±3.0	4(201)	-0.22 [-0.70, 0.25]	49%	0.35

PES, tracheostomized						
• Overall	4.8±3.9	6.2±4.3	2(83)	-0.68 [-1.69, 0.33]	76%	0.19
• RCT	4.8±3.9	6.2±4.3	2(83)	-0.68 [-1.69, 0.33]	76%	0.19

CI: Confidence intervals; tDCS: transcranial Direct Current Stimulation; I^2: Heterogeneity; n: Number of studies; N: Number of patients; NMES: Neuromuscular Electrical Stimulation; NRCT: RCT: Non-randomized controlled trial (Cohort, before after, case-control studies); p: Statistical significance value; PES: Pharyngeal Electrical Stimulation; RCT: Randomized controlled trial; SD: Standard Deviation; SMD: Standard Mean Difference; rTMS: repetitive Transcranial Magnetic Stimulation

Figure 1: Improvement in dysphagia score with different stimulations in patients with dysphagia after stroke

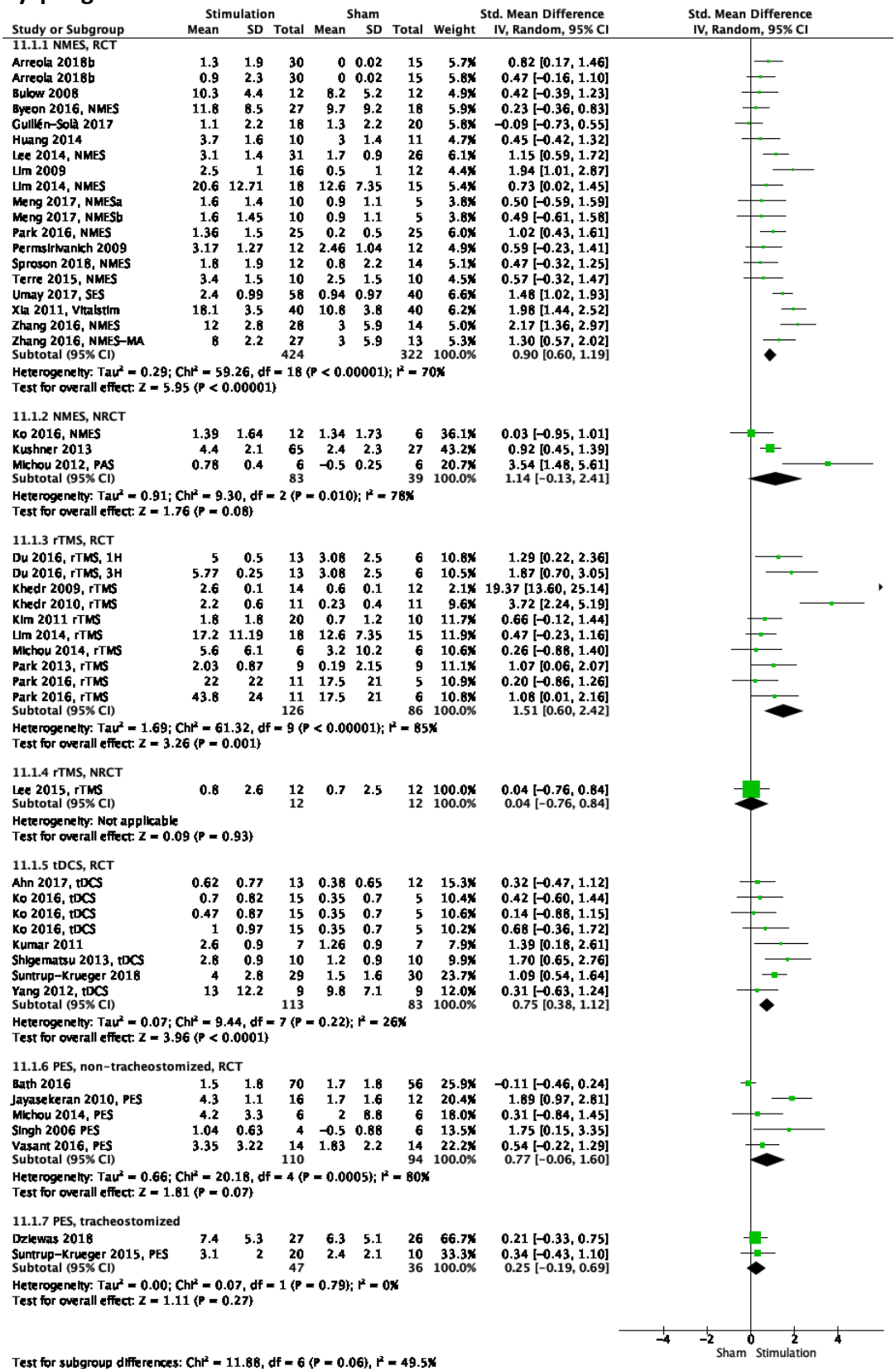


Figure 2: Dysphagia score after different stimulations in patients with dysphagia after stroke

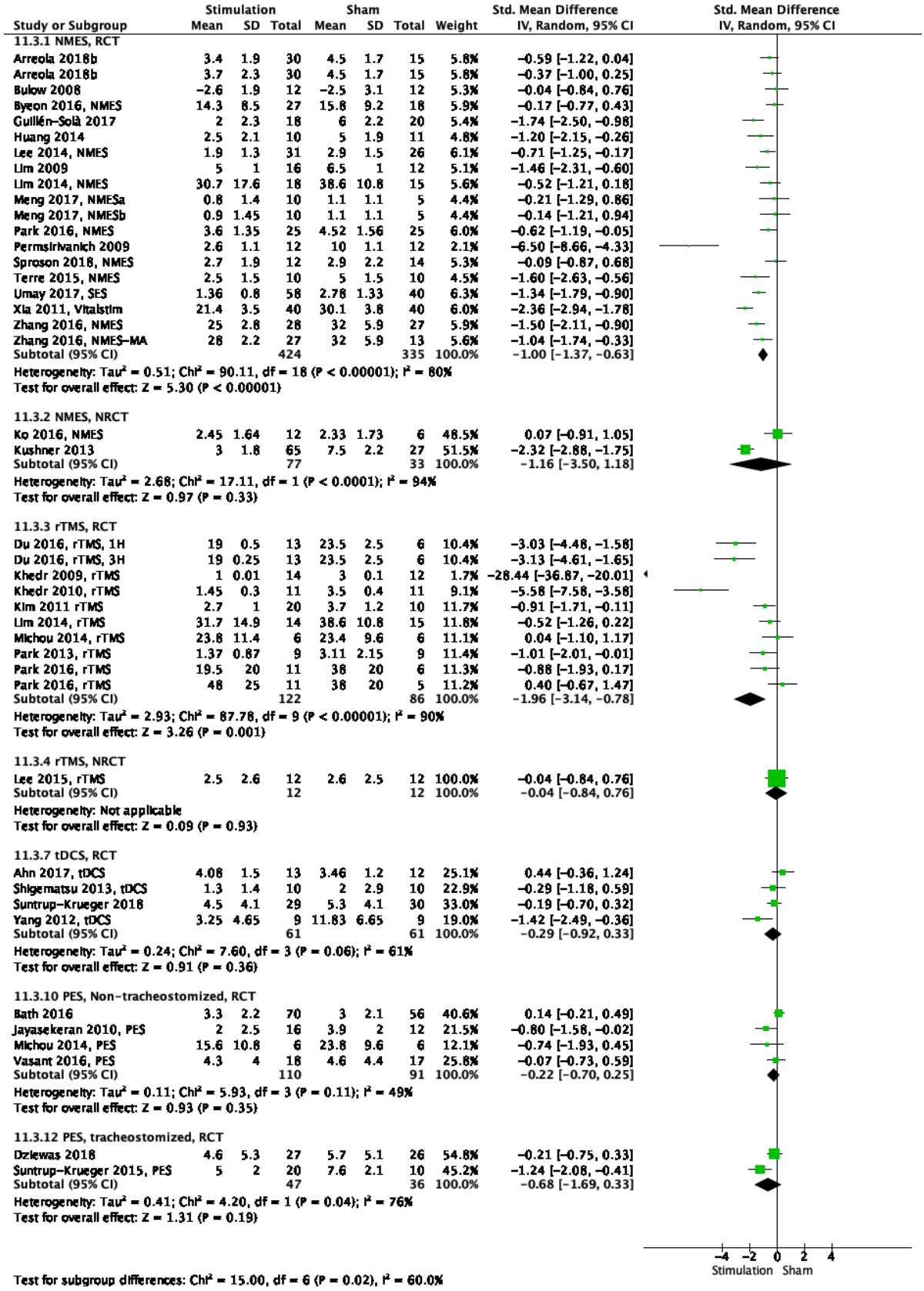


Table 2: Effect of stimulation on dysphagia score of increasing-order[a] in patients with dysphagia after stroke

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Stimulation	Control				
DSRS						
• Change, RCT	-3.7±2.7	-2.0±2.3	9(380)	-2.00 [-2.08, -1.93]	0%	< 0.00001
• Post-intervention, RCT	3.4±3.6	4.3±3.6	8(352)	-1.97 [-2.16, -1.78]	23%	< 0.00001
FEDSS						
• Change, RCT	-2.1±1.0	-0.8±0.9	2(157)	-1.14 [-1.79, -0.49]	78%	0.0005
• Post-intervention, RCT	1.7±1.0	2.7±1.4	2(157)	-0.96 [-1.96, 0.03]	79%	0.06
FDS						
• Change, overall	-11.3±10.3	-7.1±9.0	9(231)	-2.37 [-4.51, -0.23]	0%	0.03
• Change, RCT	-11.6±9.8	-7.0±6.7	7(189)	-2.39 [-4.58, -0.19]	0%	0.03
• Change, NRCT	-10.4±12.5	-7.3±18.4	2(42)	-2.09 [-11.74, 7.55]	0%	0.67
• Post-intervention, overall	18.1±12.3	19.9±12.0	9(227)	-3.64 [-5.77, -1.51]	0%	0.0008
• Post-intervention, RCT	18.5±12.2	20.8±10.5	7(185)	-3.79 [-5.97, -1.61]	0%	0.0007
• Post-intervention, NRCT	16.3±12.5	16.4±18.4	2(42)	-0.73 [-10.38, 8.91]	0%	0.88
PAS						
• Change, overall	-1.7±2.0	-0.9±1.8	21(606)	-1.19 [-1.72, -0.66]	79%	< 0.0001
• Change, RCT	-1.8±2.0	-0.9±1.8	18(552)	-1.28 [-1.94, -0.61]	82%	< 0.00001
• Change, NRCT	-1.0±1.8	-0.6±1.7	3(54)	-0.87 [-1.73, -0.01]	36%	0.05
• Post-intervention, overall	3.9±2.3	4.7±2.6	19(590)	-0.61 [-0.96, -0.26]	10%	0.0006
• Post-intervention, RCT	4.1±2.3	4.9±2.6	17(548)	-0.67 [-1.05, -0.29]	16%	0.0006
• Post-intervention, NRCT	2.5±2.1	2.5±2.2	3(42)	0.03 [-1.26, 1.32]	0%	0.96
SSA						
• Change, overall	-11.6±2.4	-7.0±4.3	5(200)	-4.88 [-7.79, -1.97]	88%	0.001
• Change, RCT	-11.6±2.4	-7.0±4.3	5(200)	-4.88 [-7.79, -1.97]	88%	0.001
• Post-intervention, overall	23.2±2.4	29.9±4.5	5(213)	-5.41 [-7.82, -3.00]	84%	< 0.00001
• Post-intervention, RCT	23.2±2.4	29.9±4.5	5(213)	-5.41 [-7.82, -3.00]	84%	< 0.00001
VDS						
• Change, RCT	-22.0±13.4	-8.4±6.7	4(101)	-9.66 [-15.62, -3.69]	38%	0.002
• Post-intervention,	41.5±16.2	48.2±12.8	4(101)	-5.33 [-17.01, 6.36]	70%	0.37

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Stimulation	Control				
RCT						
CDS						
• Change, RCT	-32.9±23.0	-17.5±21.0	2(33)	-15.55 [-36.91, 5.82]	46%	0.15
• Post-intervention, RCT	33.8±22.5	38.0±20.0	2(33)	-4.84 [-32.75, 23.06]	70%	0.73
WST						
• Change, RCT	-2.1±1.0	-0.4±1.4	2(150)	-1.58 [-2.20, -0.96]	47%	< 0.00001
• Post-intervention, RCT	2.1±0.8	3.5±1.4	2(150)	-1.42 [-1.97, -0.86]	41%	< 0.00001
NEDS						
• Change, RCT	-2.9±1.5	-0.8±2.0	1(98)	-2.11 [-2.84, -1.38]	NA	< 0.00001
• Post-intervention, RCT	4.0±1.7	5.8±1.6	1(98)	-1.77 [-2.44, -1.10]	NA	< 0.00001
BDS						
• Change, RCT	-2.0±1.2	-0.5±2.4	1(98)	-1.50 [-2.29, -0.71]	NA	0.0002
• Post-intervention, RCT	4.0±2.1	4.8±1.8	1(98)	-0.75 [-1.53, 0.03]	NA	0.06
TDS						
• Change, RCT	-4.8±2.1	-1.1±3.2	1(98)	-3.76 [-4.90, -2.62]	NA	< 0.00001
• Post-intervention, RCT	7.0±3.6	10.0±2.6	1(98)	-2.95 [-4.16, -1.74]	NA	< 0.00001

a: Worsening of dysphagia with increase of dysphagia score; BDS: Bedside dysphagia scale; CDS: Clinical dysphagia scale; CI: Confidence intervals; DSRS: Dysphagia Severity Rating Scale; FDS: Functional Dysphagia Scale; FEDSS: Fiberoptic Endoscopic Dysphagia Severity Scale; I^2: Heterogeneity; MD: Mean Difference; n: Number of studies; N: Number of patients; NEDS: Neurological Examination of Dysphagia Scale; p: Statistical significance value; PAS: Penetration-Aspiration Scale; SD: Standard Deviation; SFSS: Swallow function scoring system; SSA: Standardized Swallowing Assessment; TDS: Total Dysphagia Score

Fig 3: Effect of stimulation on DSRS in patients with dysphagia after stroke

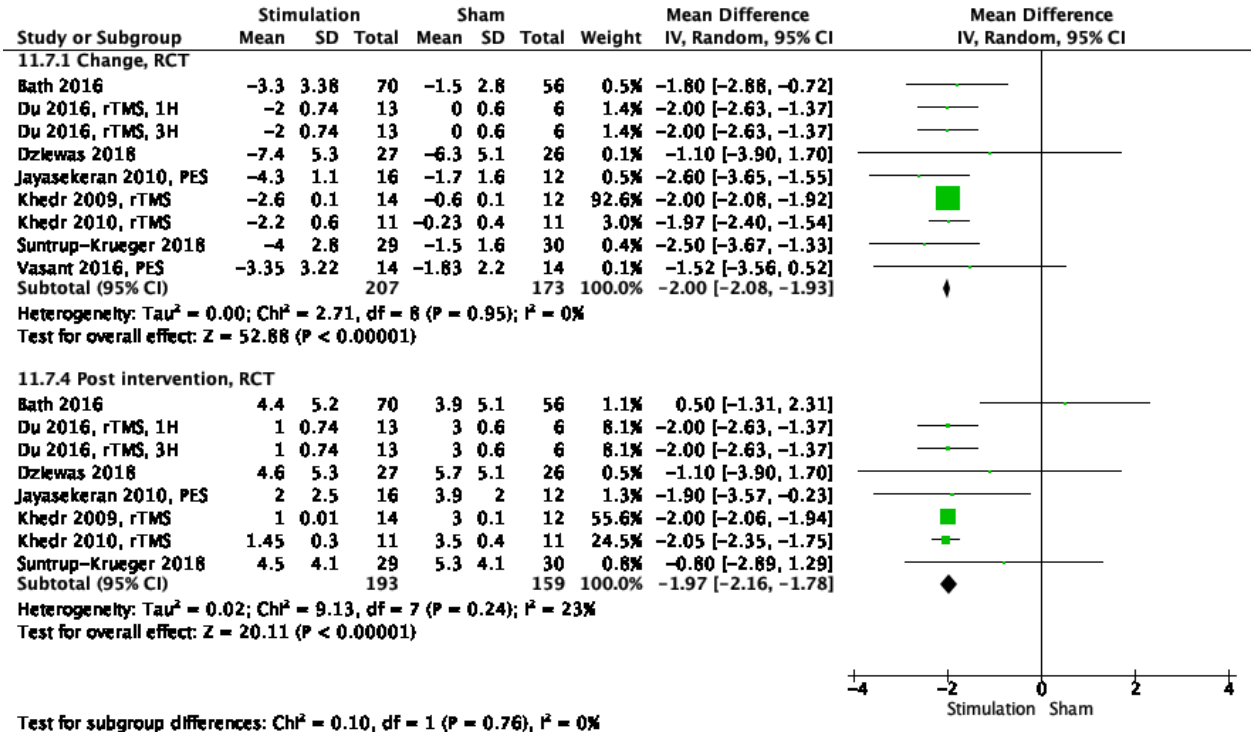


Fig 4: Effect of stimulation on FEDSS in patients with dysphagia after stroke

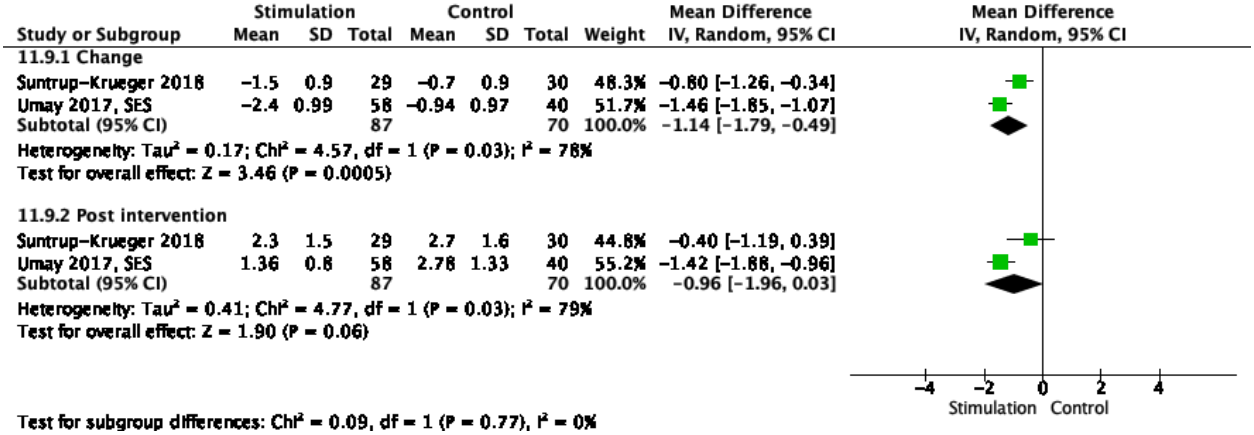


Fig 5: Effect of stimulation on FDS in patients with dysphagia after stroke

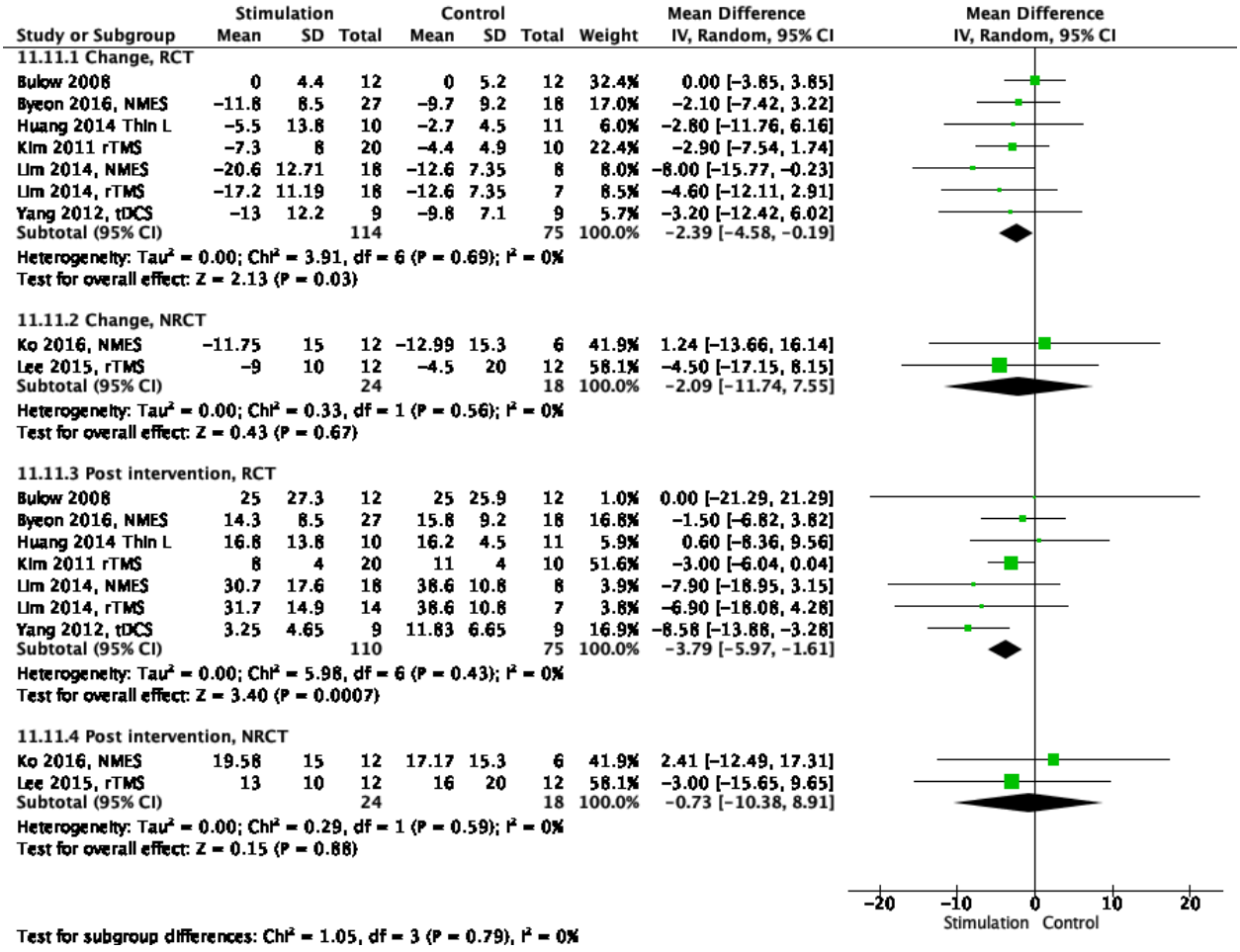


Fig 6: Effect of stimulation on PAS in patients with dysphagia after stroke

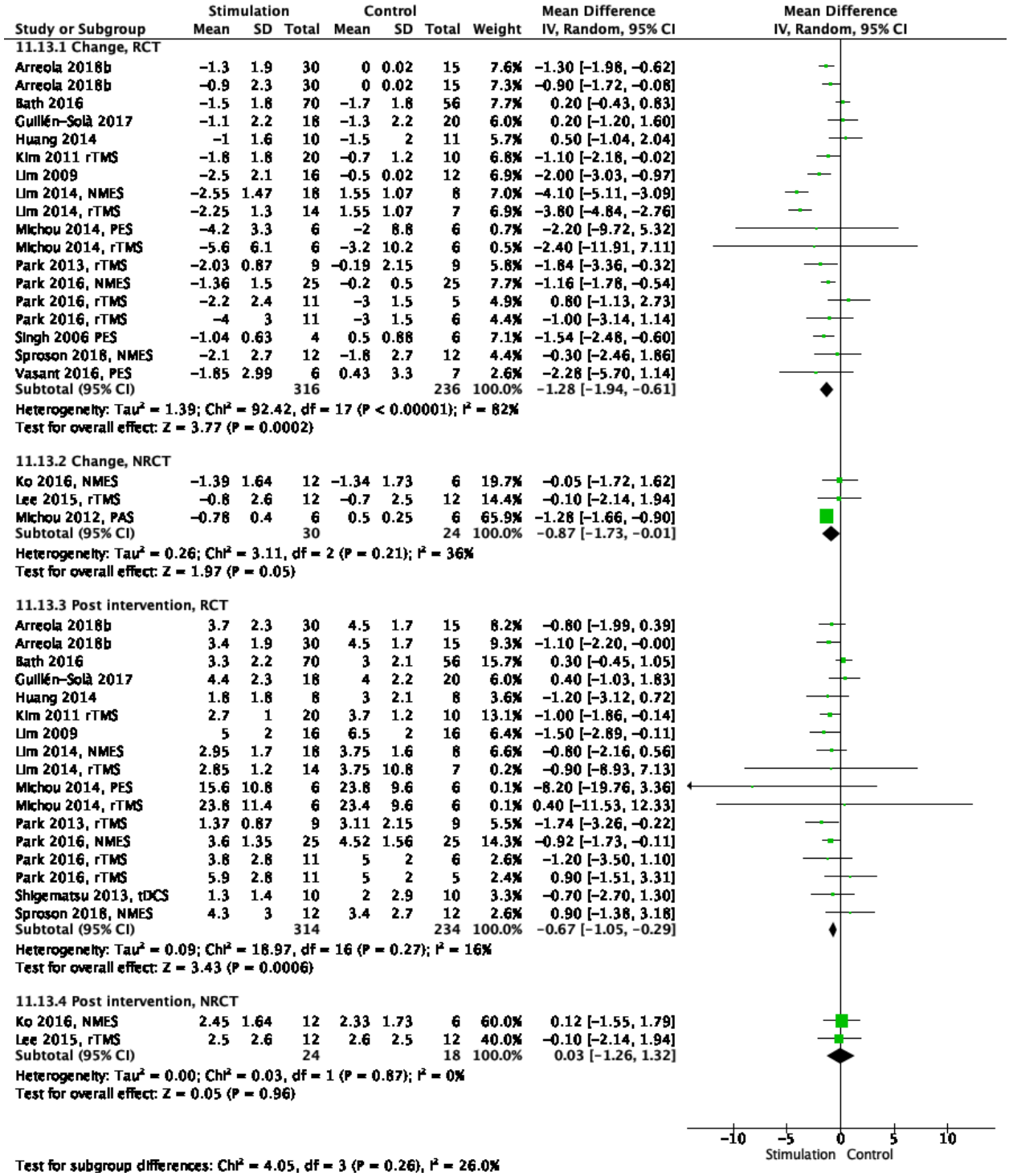


Fig 7: Effect of stimulation on SSA in patients with dysphagia after stroke

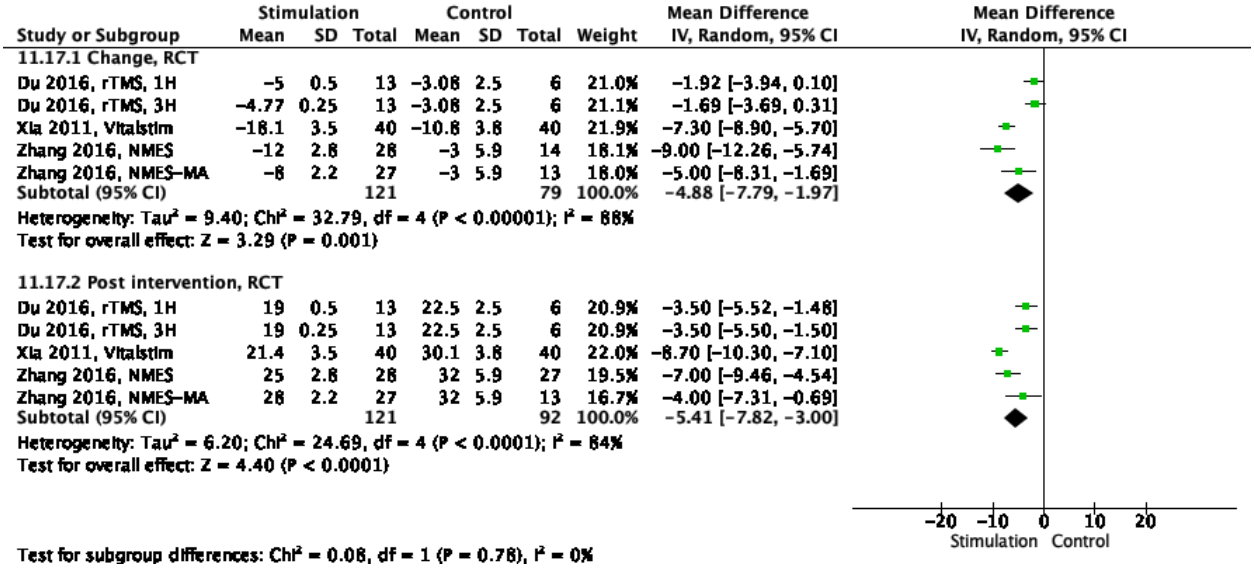


Fig 8: Effect of stimulation on VDS in patients with dysphagia after stroke

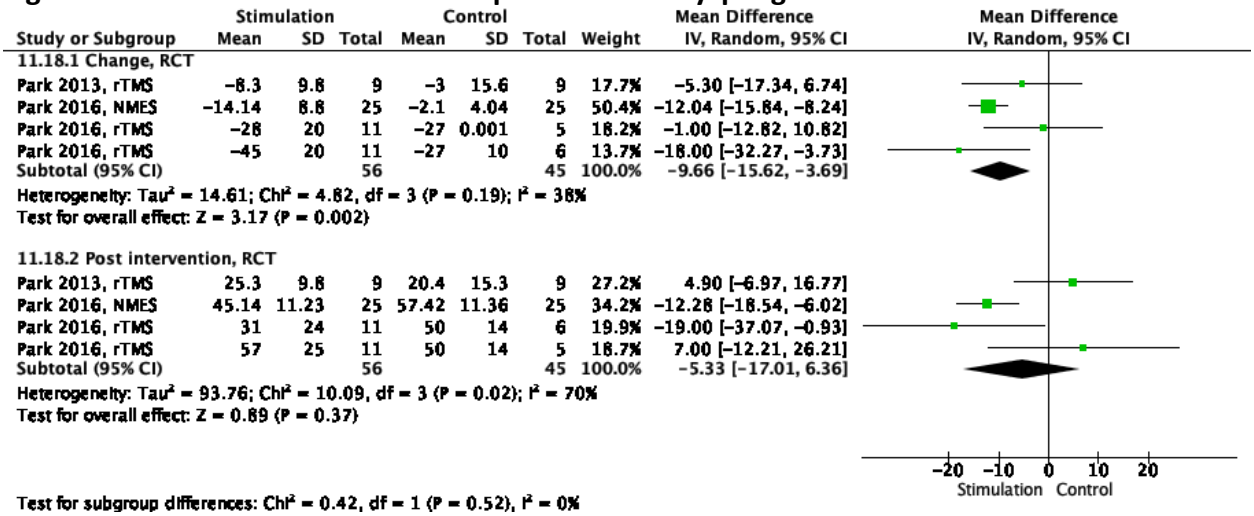


Fig 9: Effect of stimulation on CDS in patients with dysphagia after stroke

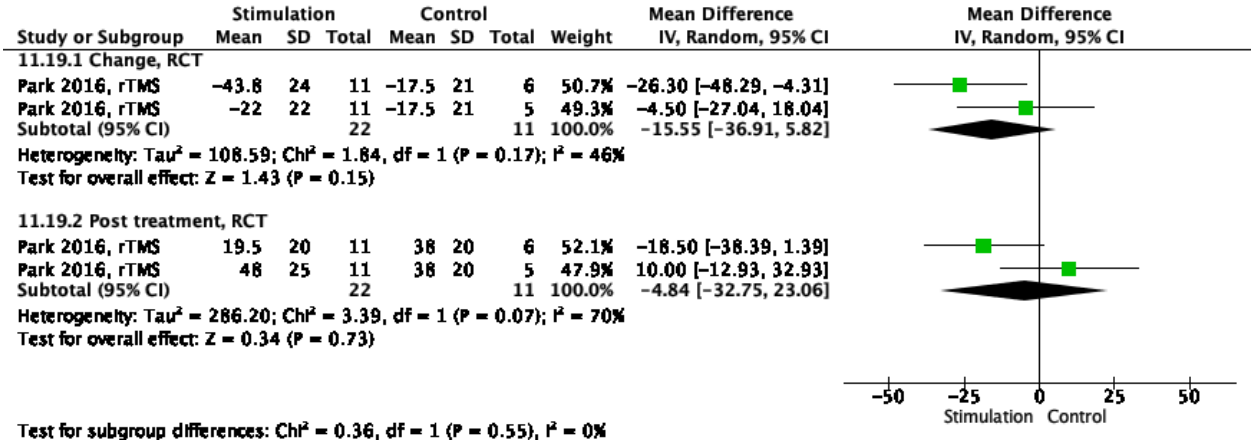


Fig 10: Effect of stimulation on WST in patients with dysphagia after stroke

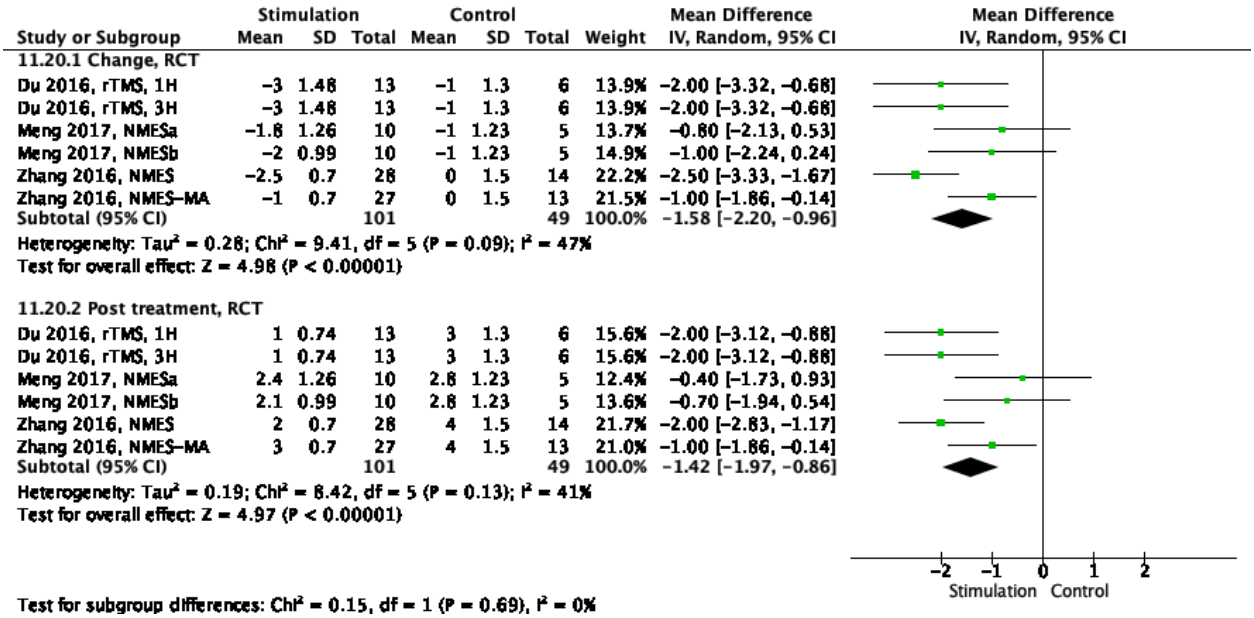


Fig 11: Effect of stimulation on NEDS, BDS, and TDS scores in patients with dysphagia after stroke

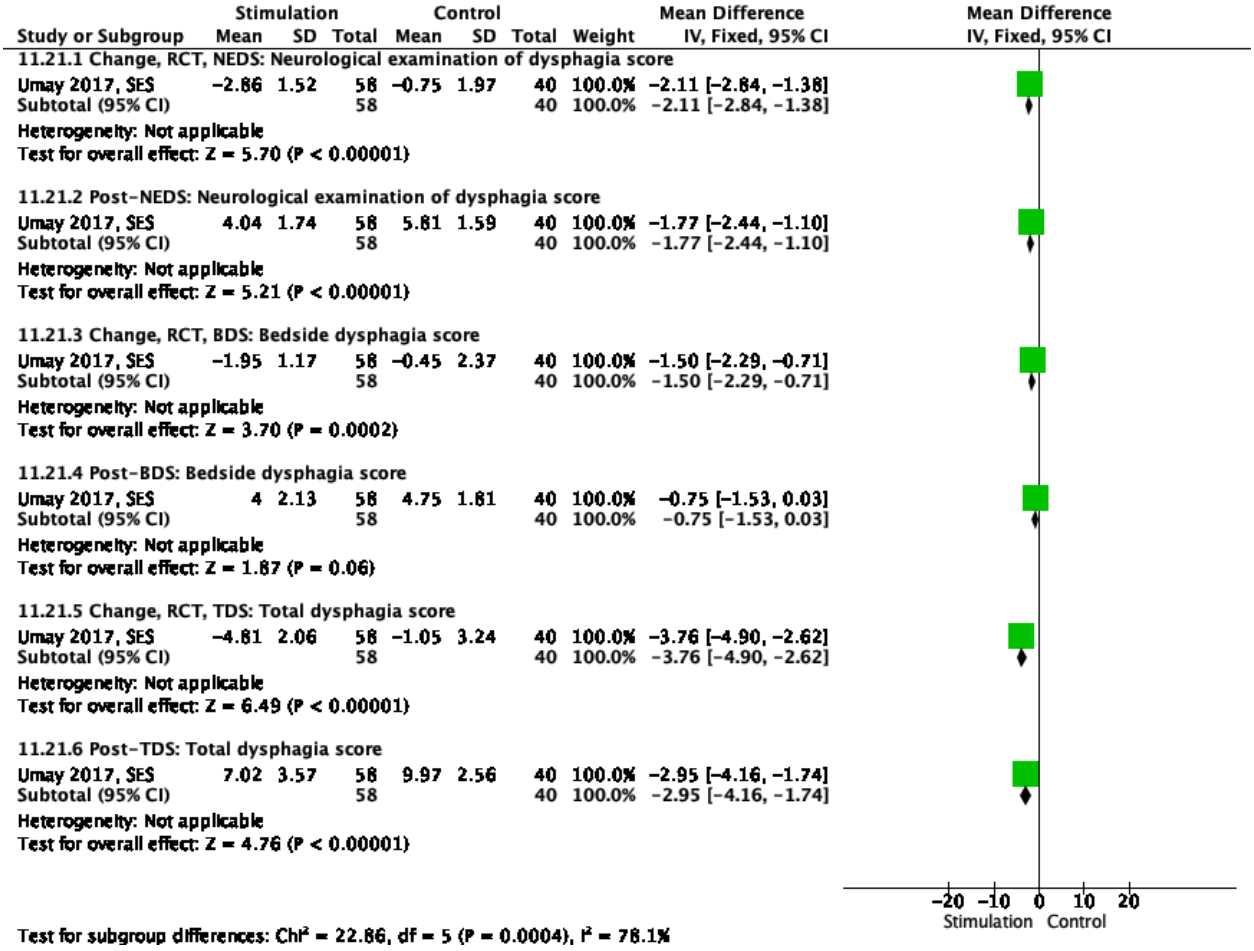


Table 3: Effect of stimulation on dysphagia score of decreasing-order[a] in patients with dysphagia after stroke

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Stimulation	Control				
FOIS						
• Change, overall	3.4±1.9	1.9±1.8	11(464)	1.28 [0.75, 1.80]	60%	< 0.00001
• Change, RCT	3.1±1.8	1.8±1.7	10(372)	1.19 [0.63, 1.76]	60%	<0.0001
• Change, NRCT	4.4±2.1	2.4±2.3	1(92)	2.00 [0.99, 3.01]	NA	< 0.0001
• Post-intervention, overall	5.0±1.9	4.0±2.1	11(464)	1.04 [0.57, 1.52]	40%	< 0.0001
• Post-intervention, RCT	4.9±1.9	4.1±2.0	10(372)	0.94 [0.44, 1.44]	36%	0.0002
• Post-intervention, NRCT	5.1±1.8	3.3±2.2	1(92)	1.80 [0.86, 2.74]	NA	0.0002
DOSS						
• Change, overall	2.2±1.3	1.5±1.2	12(286)	0.85 [0.45, 1.24]	55%	< 0.0001
• Change, RCT	2.3±1.3	1.6±1.2	11(262)	0.81 [0.39, 1.24]	58%	0.0002
• Change, NRCT	1.7±1.6	0.4+1.4	1(24)	1.30 [0.10, 2.50]	NA	0.03
• Post-intervention, overall	5.2±1.5	4.5±1.3	8(212)	0.62 [0.08, 1.17]	80%	0.006
• Post-intervention, RCT	5.3±1.4	4.6±1.3	7(188)	0.72 [0.16, 1.29]	49%	0.01
• Post-intervention, NRCT	4.3±1.6	4.4±1.4	1(24)	-0.10 [-1.30, 1.10]	NA	0.87
ASHA						
• Change, overall	1.2±1.2	1.0±1.1	3(65)	0.31 [-0.17, 0.80]	0%	0.21
• Change, RCT	1.0±1.0	0.7±0.8	2(47)	0.33 [-0.17, 0.83]	0%	0.20
• Change, NRCT	1.6±1.7	1.6±2.1	1(18)	0.04 [-1.86, 1.94]	NA	0.97
• Post-intervention, overall	4.8±1.3	4.6±1.4	3(65)	0.31 [-0.33, 0.95]	0%	0.34
• Post-intervention, RCT	4.6±1.1	4.2±1.1	2(47)	0.38 [-0.29, 1.06]	0%	0.27
• Post-intervention, NRCT	5.4±1.7	5.7±2.1	1(18)	-0.26 [-2.16, 1.64]	NA	0.79
SFS						
• Change, RCT	2.0±1.0	0.0±1.0	1(32)	2.00 [1.31, 2.69]	NA	< 0.00001
• Post-intervention, RCT	4.0±2.0	4.0±2.0	1(32)	0.00 [-1.39, 1.39]	NA	1.0
MASA						
• Change, RCT	46.2±27.1	25.5±18.5	1(98)	20.70 [11.67, 29.73]	NA	< 0.00001
• Post-intervention,	181.3±20.7	157.8±33.6	1(98)	23.46 [11.77, 35.15]	NA	< 0.00001

Outcome	Mean±SD		n (N)	MD [95% CI]	I^2	P value
	Stimulation	Control				
RCT						
RSST						
• Change, RCT	1.5±1.8	1.2±1.4	2(30)	0.30 [-0.86, 1.46]	0%	0.61
• Post-intervention, RCT	5.3±1.8	5.1±1.4	2(30)	0.15 [-1.01, 1.30]	0%	0.80
Dysphagia limit						
• Change, RCT	5.0±5.6	1.9±3.2	1(55)	3.1 [0.06, 6.14]	NA	0.05
• Post-intervention, RCT	10.9±7.8	9.6±7.1	1(55)	1.3 [-3.05, 5.65]	NA	0.56

a: Worsening of dysphagia with decrease of dysphagia score; CI: Confidence intervals; DOSS: Dysphagia Outcome and Severity Scale; FOIS: Functional oral intake scale; I^2: Heterogeneity; MASA: Mann Assessment of Swallowing Ability; MD: Mean Difference; n: Number of studies; N: Number of patients; p: Statistical significance value; SD: Standard Deviation; SFS: Swallow functional score

Fig 12: Effect of stimulation on FOIS in patients with dysphagia after stroke

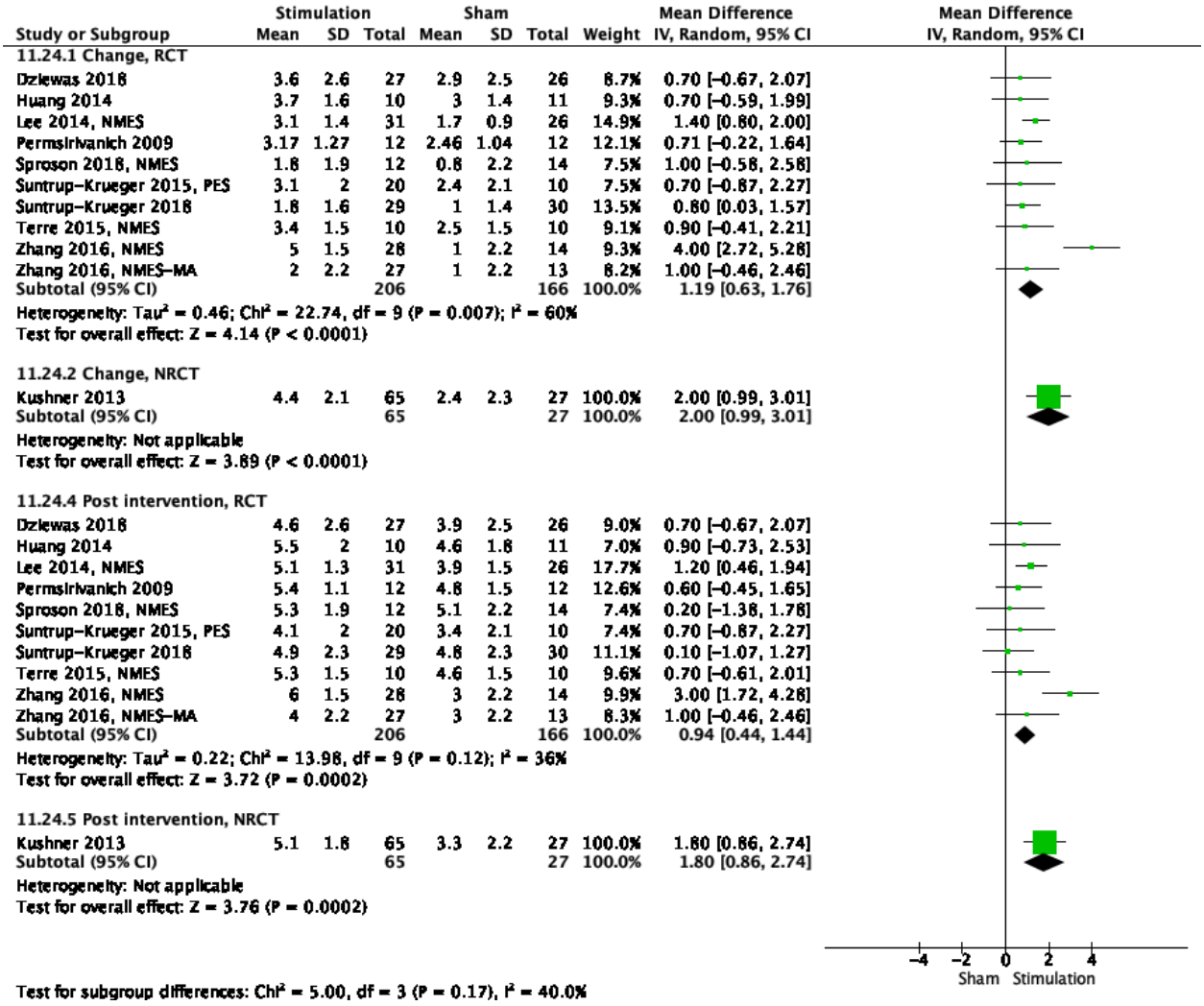


Fig 13: Effect of stimulation on DOSS in patients with dysphagia after stroke

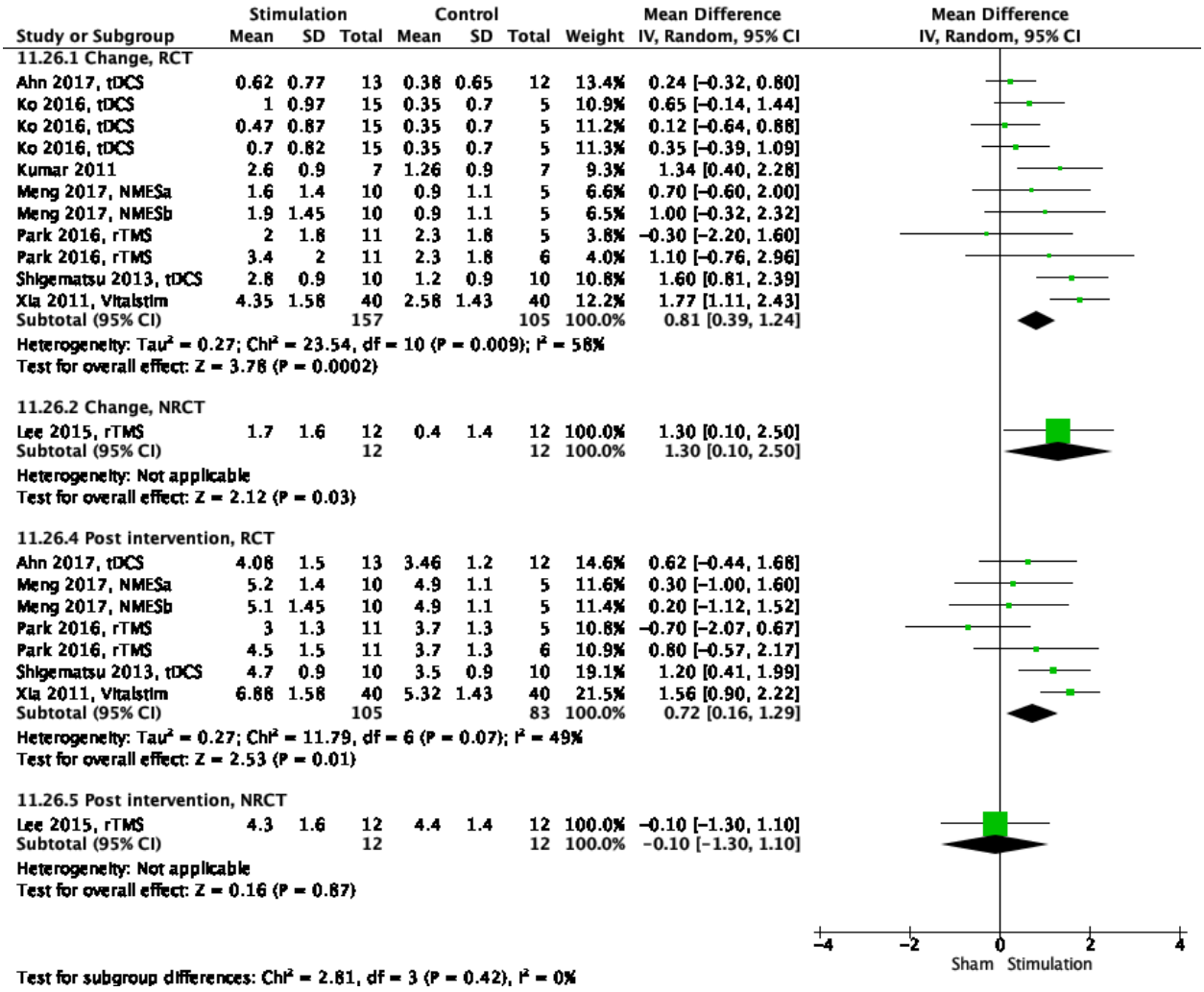


Fig 14: Effect of stimulation on ASHA in patients with dysphagia after stroke

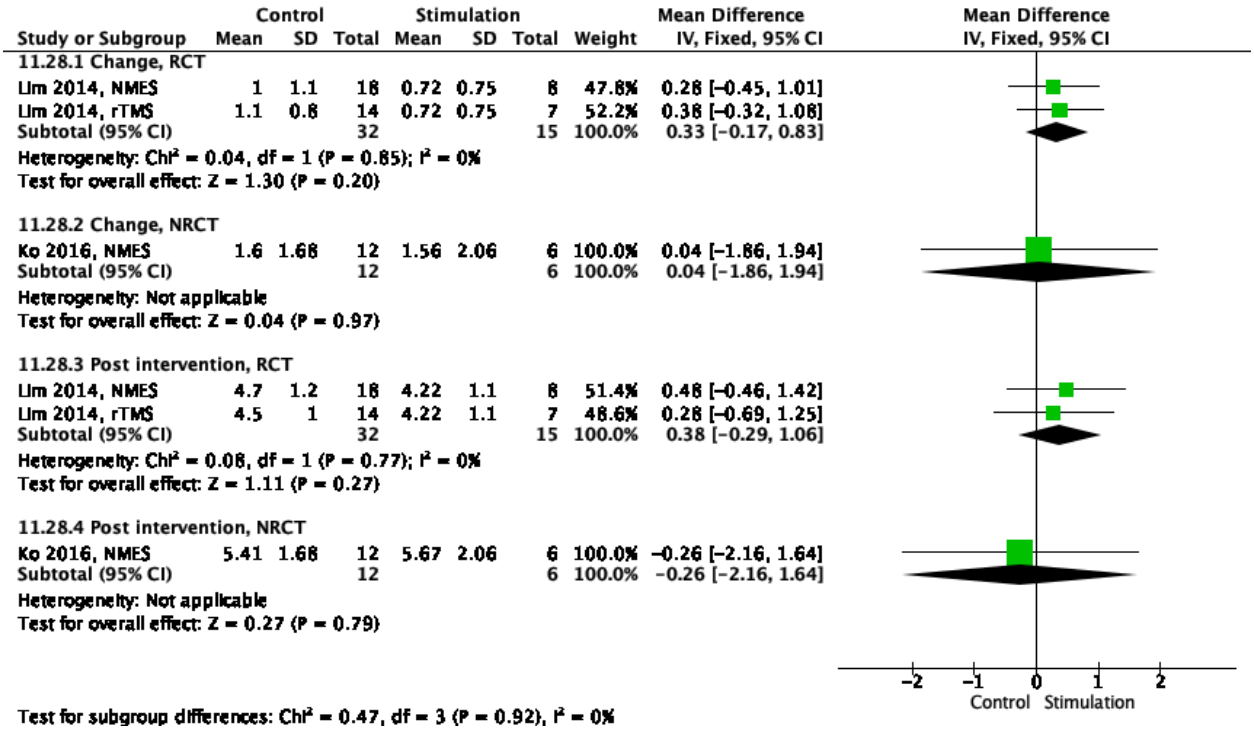


Fig 15: Effect of stimulation on SFS (Swallow functional score) in patients with dysphagia after stroke

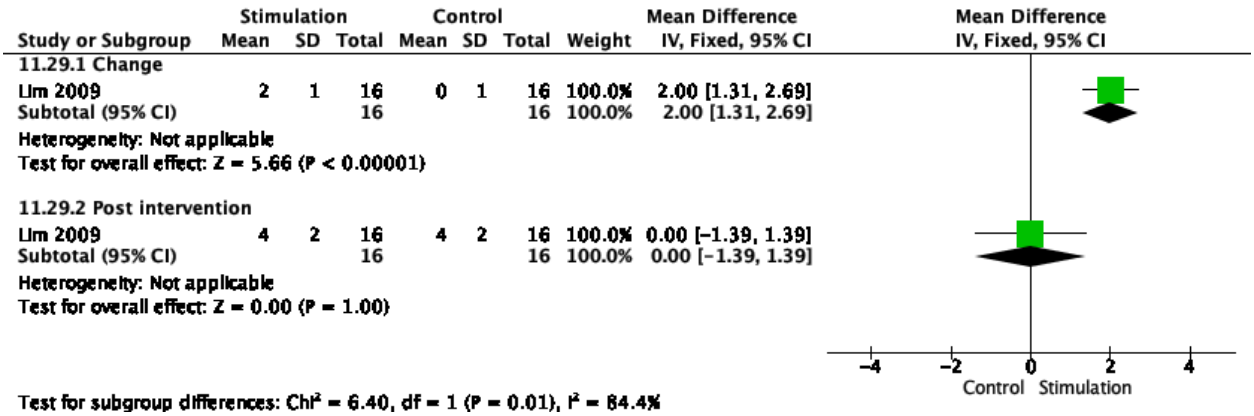


Fig 16: Effect of stimulation on MASA in patients with dysphagia after stroke

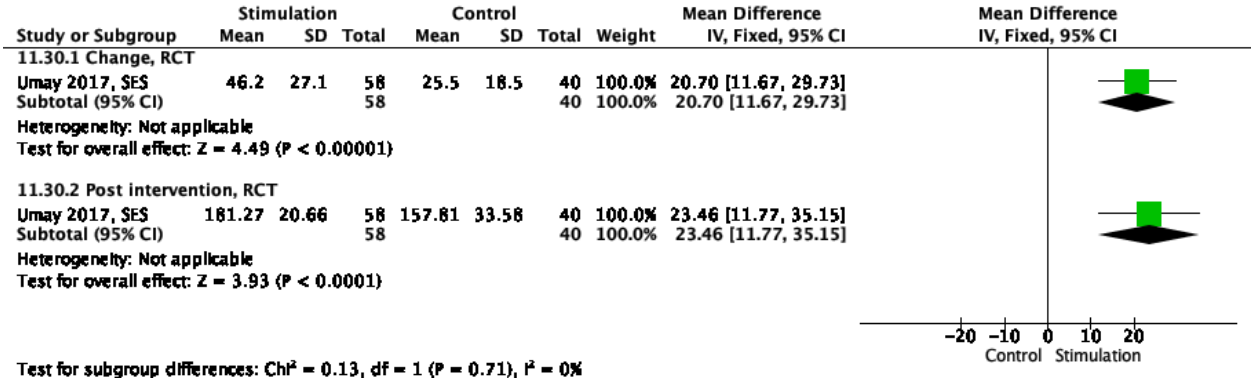


Fig 17: Effect of stimulation on RSST in patients with dysphagia after stroke

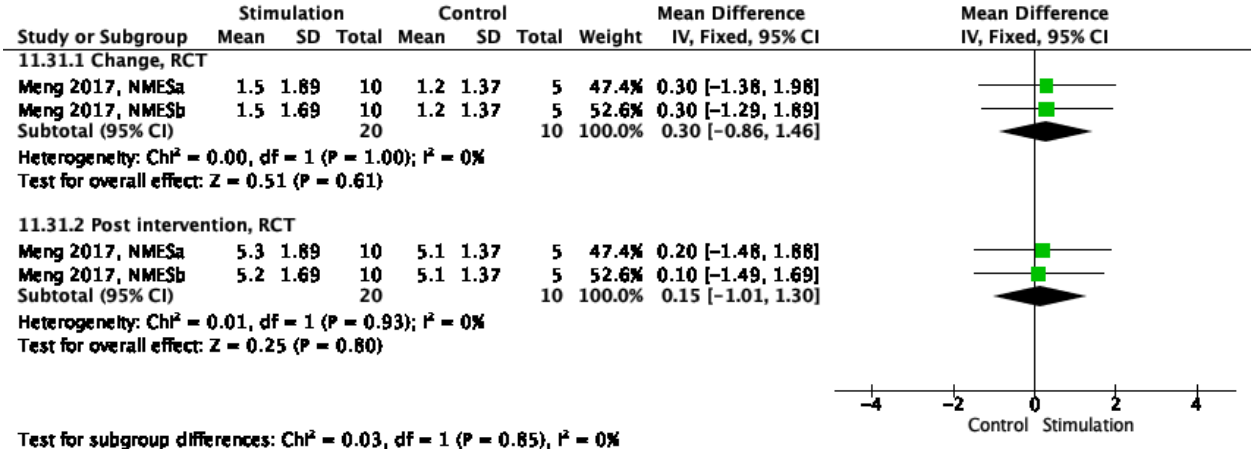


Fig 18: Effect of stimulation on Dysphagia limit in patients with dysphagia after stroke

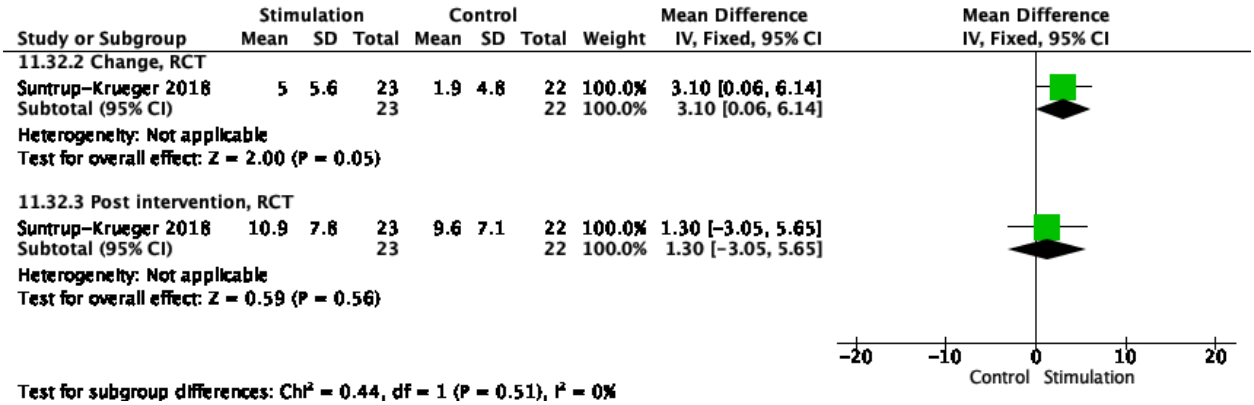
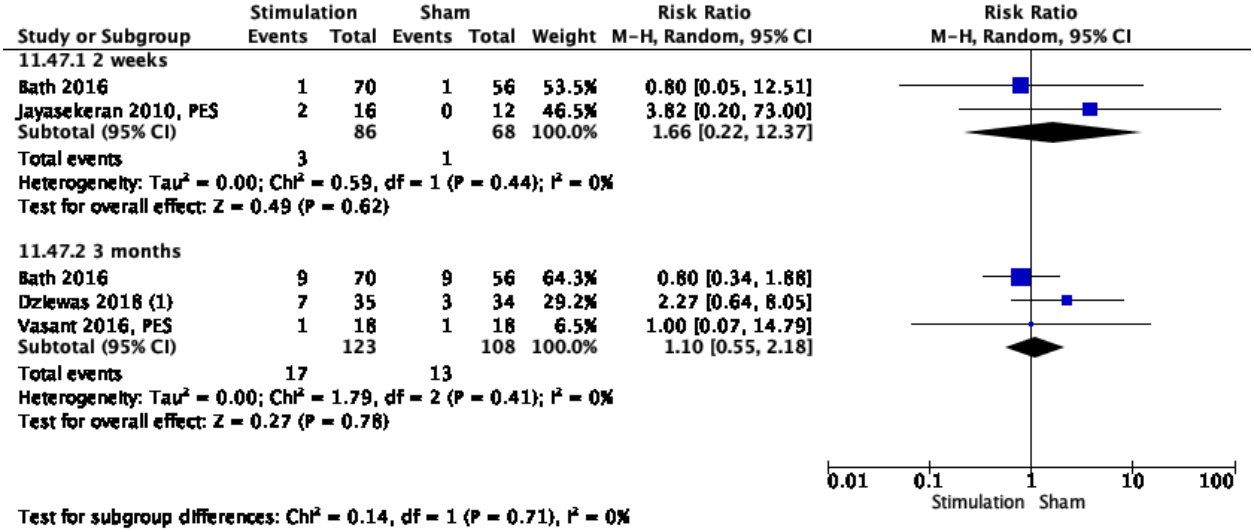


Table 4: Effect of stimulation on mortality, mRS, pneumonia, BI, and length of stay in patients with dysphagia after stroke

Outcome	Mean±SD/ %		n (N)	MD/ RR [95% CI]	I^2	P value
	Stimulation	Control				
Mortality, RCT						
• 2 weeks, PES	3.5%	1.5%	2(154)	1.66 [0.22, 12.37]	0%	0.62
• 3 months, PES	13.8%	12.0%	3(231)	1.10 [0.55, 2.18]	0%	0.78
mRS, RCT	3.2±1.0	3.9±1.0	3(215)	-0.68 [-1.22, -0.13]	62%	0.01
• rTMS	1.0±0.7	2.5±1.3	1(38)	-1.50 [-2.29, -0.71]	0%	0.0002
• PES	3.8±1.1	4.2±1.0	2(177)	-0.33 [-0.63, -0.02]	0%	0.04
Pneumonia, RCT						
• TES	5.8%	8.5%	2(99)	0.75 [0.19, 2.95]	NA	0.68
• tDCS	37.9%	53.3%	1(59)	0.71 [0.40, 1.26]	NA	0.24
• PES	7.6%	11.5%	2(209)	0.66 [0.29, 1.52]	0%	0.33
BI						
• rTMS, Overall	76.8±7.9	52.8±14.5	5(110)	29.54 [25.82, 33.26]	87%	< 0.00001
• rTMS, RCT	79.8±5.1	46.9±12.7	4(86)	31.57 [27.75, 35.39]	73%	< 0.00001
• rTMS, NRCT	64.0±20.0	70.0±20.0	1(24)	-6.00 [-22.00, 10.00]	NA	0.46
• PES, RCT	36.1±30.5	27.0±25.7	2(154)	-0.34 [-1.19, 0.51]	74%	0.43
LOS, Hospital (d), RCT						
• tDCS	16.2±6.8	13.4±5.1	1(59)	2.80 [-0.28, 5.88]	NA	0.07
• PES	32.4±20.7	35.3±22.1	3(192)	-4.23 [-12.11, 3.66]	33%	0.29
LOS, ICU (d), RCT						
• tDCS	6.7±4.4	7.0±3.3	1(59)	-0.30 [-2.29, 1.69]	NA	0.77
• PES	38.2±14.9	38.8±19.7	1(59)	-0.60 [-14.45, 13.25]	NA	0.93

CI: Confidence intervals; ICU: Intensive care unit; I^2: Heterogeneity; LOS: Length of Stay; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; QoL: Quality of life; SD: Standard Deviation; MD: Mean Difference; RR: Risk Ratio

Fig 19: Effect of PES on Mortality in patients with dysphagia after stroke



Footnotes

(1) None related to PES

Fig 20: Effect of stimulation on mRS in patients with dysphagia after stroke

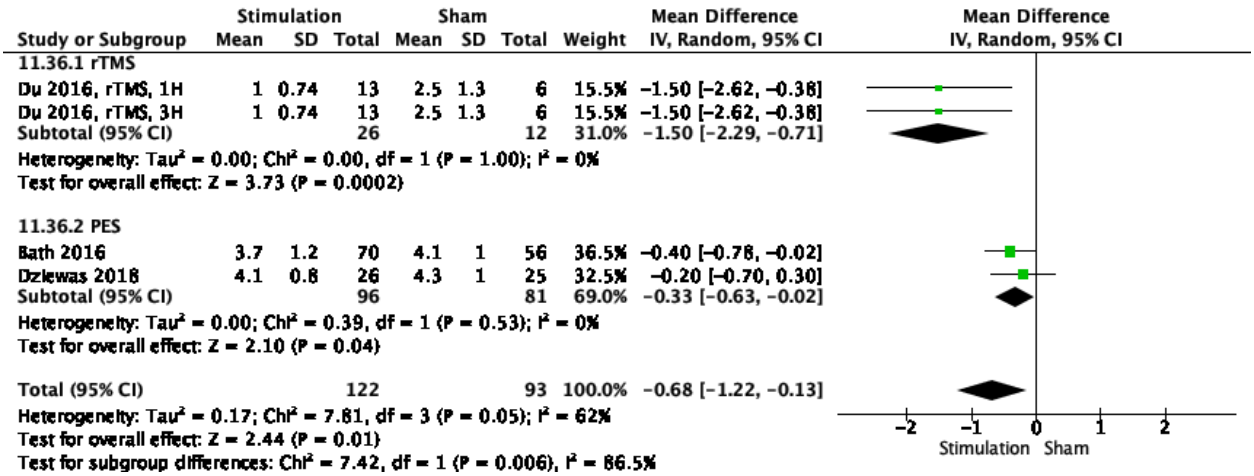
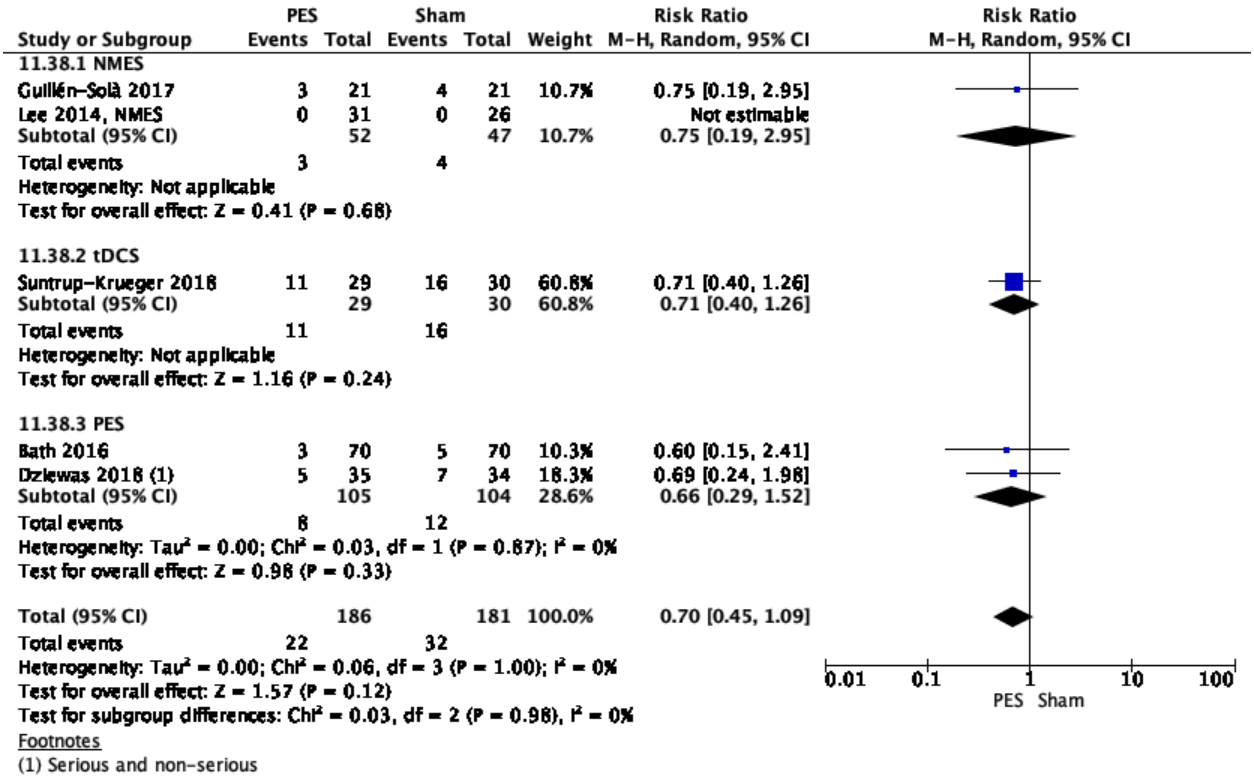


Fig 21: Effect of stimulation on Pneumonia in patients with dysphagia after stroke



Footnotes

(1) Serious and non-serious

Fig 22: Effect of stimulation on BI in patients with dysphagia after stroke

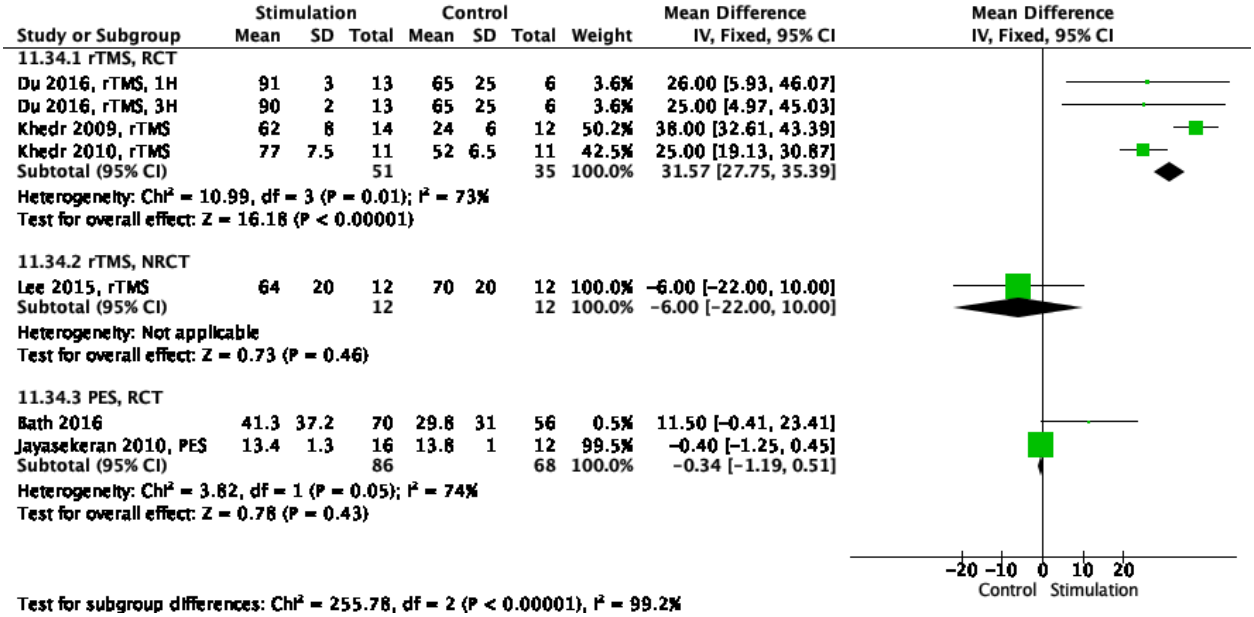


Fig 23: Effect of stimulation on Length of stay in Hospital or ICU in patients with dysphagia after stroke

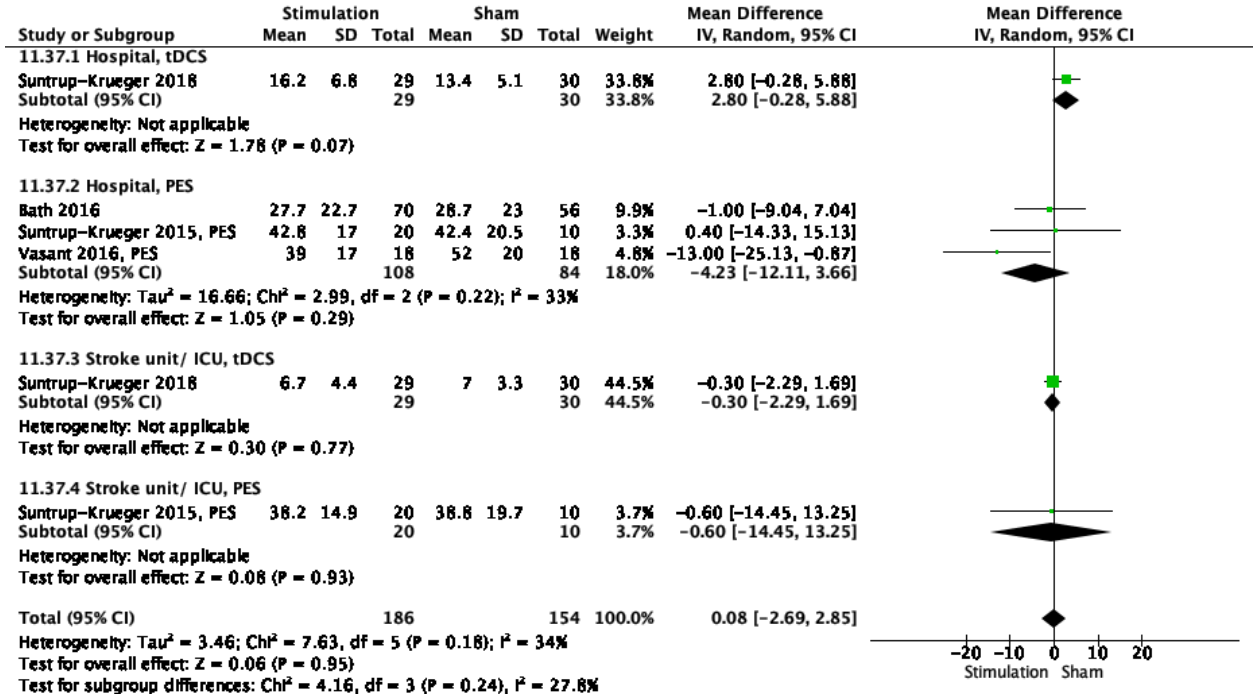


Table 5: Effect of stimulation on different outcomes in patients with dysphagia after stroke

Outcome	Mean±SD/ %		n (N)	MD/ RR [95% CI]	I^2	P value
	Stimulation	Control				
Decannulation						
• Tracheotomised patients, PES, Overall	59.0%	7.5%	3(145)	5.43 [2.42, 12.16]	0%	< 0.0001
• Tracheotomised patients, PES, RCT	58.2%	11.4%	2(99)	4.64 [2.00, 10.79]	0%	0.004
• Tracheotomised patients, PES, NRCT	60.9%	0.0%	1(46)	29.00 [1.83, 459.04]	NA	0.02
Tube removal						
• Other patients, NMES, RCT	50.0%	14.3%	1(19)	3.50 [0.52, 23.42]	NA	0.2
• Other patients, PES, RCT	50.0%	28.6%	1(30)	1.75 [0.67, 4.58]	NA	0.25
Quality of life, Anxiety and Depression						
Change, RCT						
Swallowing QoL	26.2±18.2	7.2±17.1	3(106)	18.02 [11.41, 24.63]	37%	<0.00001
Hamilton anxiety scale	-4.0±6.0	-0.2±6	1(112)	-3.83 [-6.06, -1.60]	NA	0.0007
Hamilton depression scale	-3.9±5.0	-0.9±5.0	1(112)	-2.94 [-4.79, -1.09]	NA	0.002
Functional independence measure	21.5±19.0	9.3±23.3	1(98)	12.20 [3.48, 20.92]	NA	0.006
Post intervention, RCT						
EQ-5D as HUS (Health Utility status)	0.008±0.41	-0.04±0.39	1(126)	0.05 [-0.09, 0.19]	NA	0.50
EQ-VAS	51.6±30.1	48.6±31.7	1(126)	3.00 [-7.89, 13.89]	NA	0.59
Swallowing QoL	228±27	213±24	4(186)	16.26 [9.92, 22.60]	41%	<0.0001
Hamilton anxiety scale	11.3±4.8	15.3±7.0	1(112)	-4.09 [-6.33, -1.85]	NA	0.0004
Hamilton depression scale	12.2±6.9	16.3±7.6	1(112)	-4.11 [-6.79, -1.43]	NA	0.003
Functional independence	74.5±23.8	61.5±21.6	1(98)	12.95 [3.87, 22.03]	NA	0.005

measure						

CI: Confidence intervals; ICU: Intensive care unit; I^2: Heterogeneity; LOS: Length of Stay; n: Number of studies; N: Number of patients; NA: Not applicable; p: Statistical significance value; QoL: Quality of life; SD: Standard Deviation; MD: Mean Difference; RR: Risk Ratio

Fig 24: Effect of stimulation on Decannulation in tracheotomized patients and tube removal after stroke

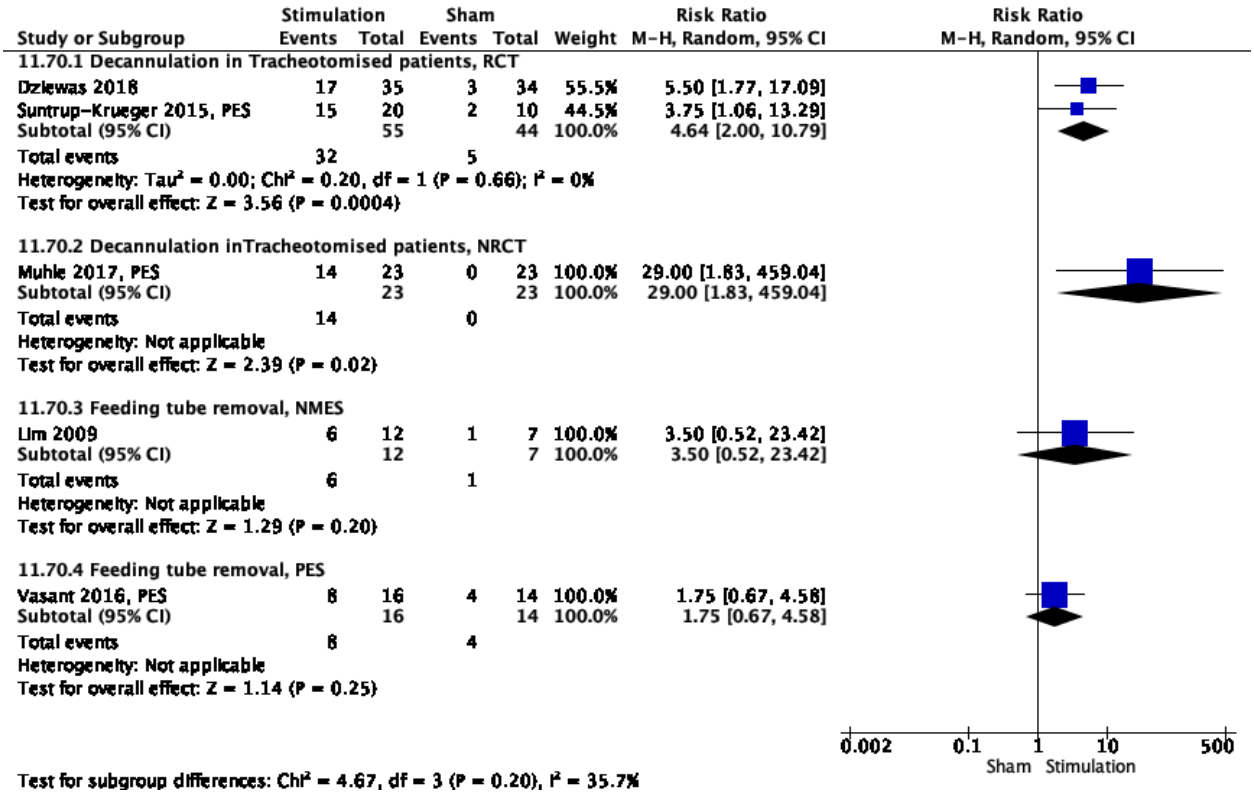
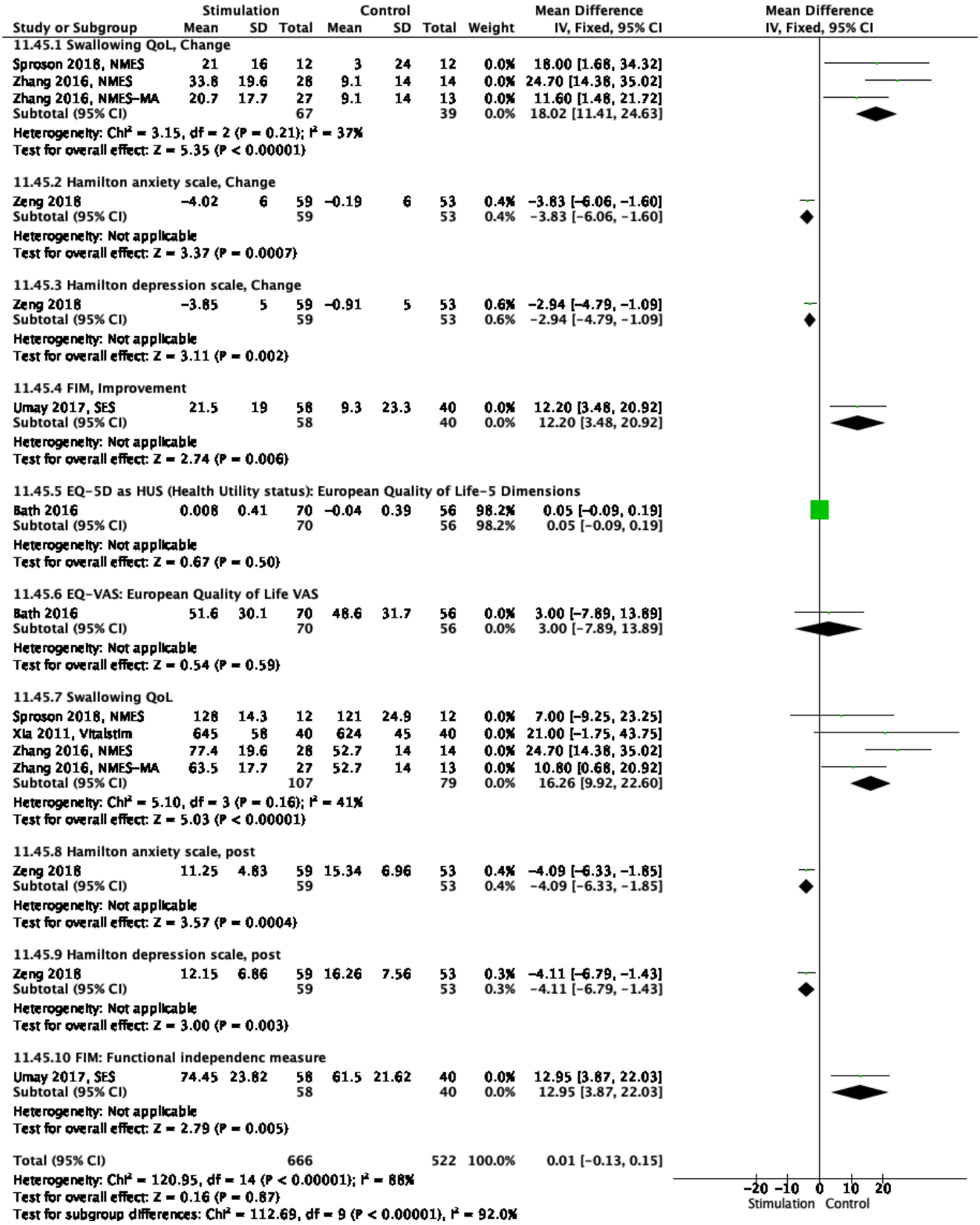


Fig 25: Effect of stimulation on Quality of life scales in patients with dysphagia after stroke



Supplement 5: Risk of Bias Analyses

Epidemiology

	Internal validity														Overall
Author	**Conduct of study**	**Selection of subjects**					**Assessment**						**Confounding**	**Analysis**	**ROB**
	1.1	**1.2**	**1.3**	**1.4**	**1.5**	**1.6**	**1.7**	**1.8**	**1.9**	**1.10**	**1.11**	**1.12**	**1.13**	**1.14**	**2.1**
Al-Khaled 2016	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Alsumrain 2013	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Arnold 2016	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Babi 2014	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Baroni 2012	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Bonilha 2014	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Brogan 2014	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Chua 1996	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Crary 2013	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
de Castillo 2017	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
DePippo 1994	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Falsetti 2009	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Finlayson 2011	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Gordon 1987	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Gottlieb 1996	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Guyomard 2009	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Hamidon 2006	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Hinds 1998	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Hoffmann 2017	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Hoffmann 2012	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Holas 1994	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Jeyaseelan 2015	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Joundi 2017	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Kidd 1995	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Kumar 2016	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Lakshminarayan 2010	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Langdon 2007	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Lim 2001	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Lord 2014	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Maeshima 2014	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Mann 1999	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Muriana 2016	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Odderson 1995	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Palomeras 2014	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Rofes 2018	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Sala 1998	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Smithard 2007	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Sundar 2007	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Wade 1987	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Wang 2001	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Zhang 2016	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable

1.1: The study addresses an appropriate and clearly focused question; 1.2: The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation; 1.3: The study indicates how many of the people asked to take part did so, in each of the groups being studied; 1.4. The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis; 1.5: What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed; 1.6: Comparison is made between full participants and those lost to follow up, by exposure status; 1.7: The outcomes are clearly defined; 1.8: The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable; 1.9: Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome; 1.10: The method of assessment of exposure is reliable; 1.11: Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable; 1.12: Exposure level or prognostic factor is assessed more than once; 1.13: The main potential confounders are

identified and taken into account in the design and analysis; 1.14: Have confidence intervals/p value been provided? 2.1: How well was the study done to minimise the risk of bias or confounding?
CS: Can't say, NA: Not applicable

Screening

	Internal validity														Overall
Author	**Conduct of study**	**Selection of subjects**					**Assessment**						**Confounding**	**Analysis**	**ROB**
	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	2.1
Al-Khaled 2016	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Bray 2017	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Clements 2009	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Diniz 2009	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	High quality
Dhufaigh 2017	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Dziewas 2008	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Gandolfi 2014	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Guillan 2015	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Han 2018	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Hincheyn 2005	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Lakshminarayan 2010	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Masrur 2013	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
McCormack 2016	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Odderson 1995	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Palli 2017	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Perry 2000	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Schrock 2017	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable
Sørensen 2013	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Titsworth 2013	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Turner 2016	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Yeh 2011	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable

1.1: The study addresses an appropriate and clearly focused question; 1.2: The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation; 1.3: The study indicates how many of the people asked to take part did so, in each of the groups being studied; 1.4. The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis; 1.5: What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed; 1.6: Comparison is made between full participants and those lost to follow up, by exposure status; 1.7: The outcomes are clearly defined; 1.8: The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable; 1.9: Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome; 1.10: The method of assessment of exposure is reliable; 1.11: Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable; 1.12: Exposure level or prognostic factor is assessed more than once; 1.13: The main potential confounders are identified and taken into account in the design and analysis; 1.14: Have confidence intervals/p value been provided? 2.1: How well was the study done to minimise the risk of bias or confounding?
CS: Can't say, NA: Not applicable

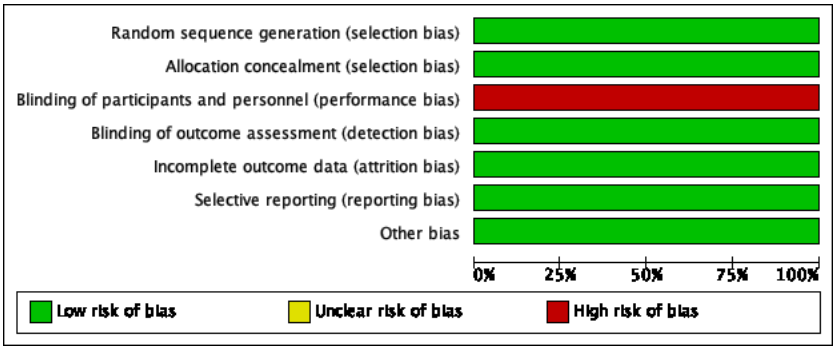
Assessment

	Internal validity														Overall
Author	**Conduct of study**	**Selection of subjects**					**Assessment**						**Confounding**	**Analysis**	**ROB**
	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	2.1
Bax 2014	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Bray 2017	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Radhakrishnan 2013	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Dhufaigh 2017	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable

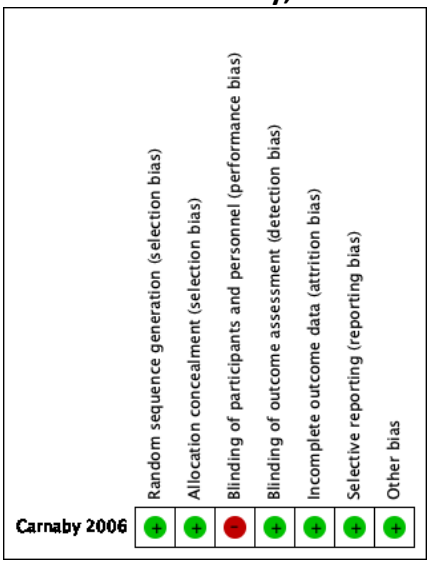
1.1: The study addresses an appropriate and clearly focused question; 1.2: The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation; 1.3: The study indicates how many of the people asked to take part did so, in each of the groups being studied; 1.4. The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis; 1.5: What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed; 1.6: Comparison is made between full participants and those lost to follow up, by exposure status; 1.7: The outcomes are clearly defined; 1.8: The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable; 1.9: Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome; 1.10: The method of assessment of exposure is reliable; 1.11: Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable; 1.12: Exposure level or prognostic factor is assessed more than once; 1.13: The main potential confounders are identified and taken into account in the design and analysis; 1.14: Have confidence intervals/p value been provided? 2.1: How well was the study done to minimise the risk of bias or confounding?
CS: Can't say, NA: Not applicable

Treatments

1. Dietary Interventions



Risk of bias summary, Consistency modification



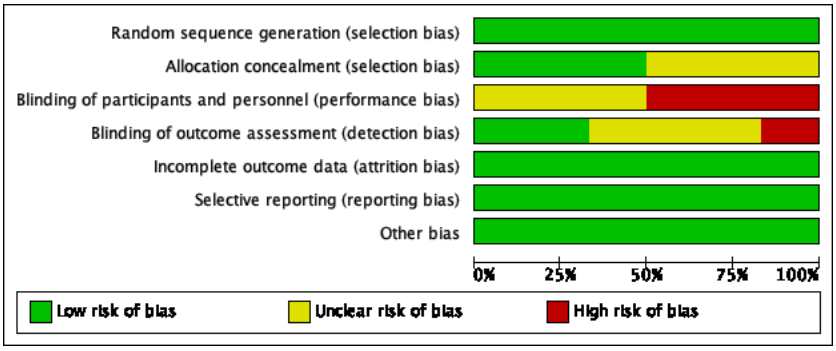
Risk of bias assessment of non-randomized studies using SIGN 50 checklist, Consistency modification

	Internal validity														Overall
Author	**Conduct of study**	**Selection of subjects**					**Assessment**						**Confounding**	**Analysis**	**ROB**
	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	2.1
Foley 2006	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable

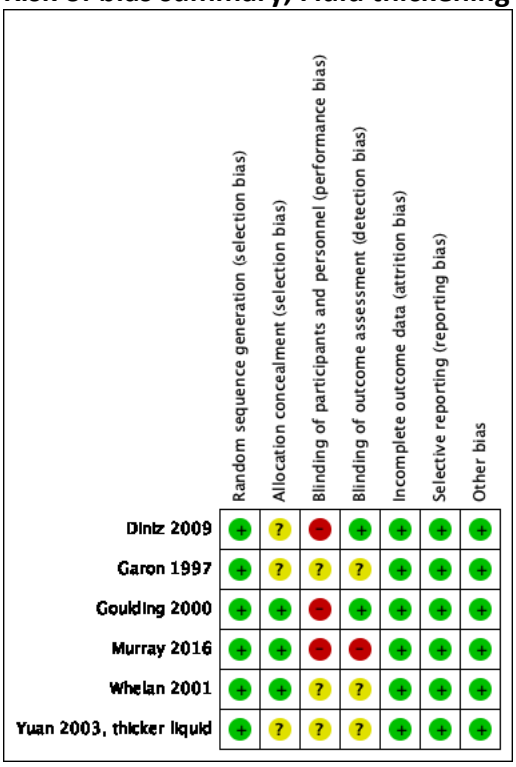
1.1: The study addresses an appropriate and clearly focused question; 1.2: The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation; 1.3: The study indicates how many of the people asked to take part did so, in each of the groups being studied; 1.4. The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis; 1.5: What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed; 1.6: Comparison is made between full participants and those lost to follow up, by exposure status; 1.7: The outcomes are clearly defined; 1.8: The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable; 1.9: Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome; 1.10: The method of assessment of exposure is reliable; 1.11: Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable; 1.12: Exposure level or prognostic factor is assessed more than once; 1.13: The main potential confounders are

identified and taken into account in the design and analysis; 1.14: Have confidence intervals/p value been provided? 2.1: How well was the study done to minimise the risk of bias or confounding?
CS: Can't say, NA: Not applicable

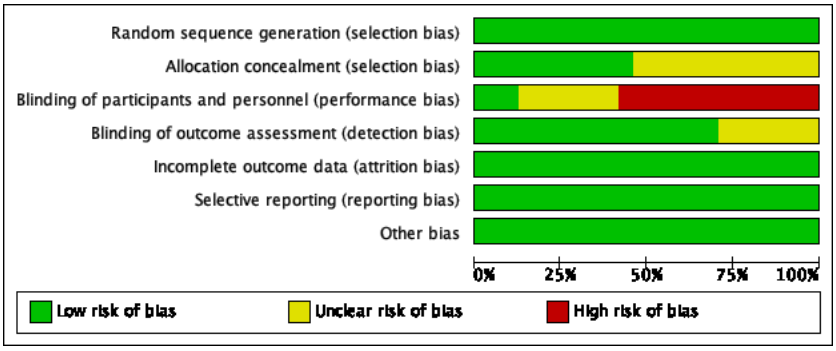
Risk of bias graph, Fluid thickening



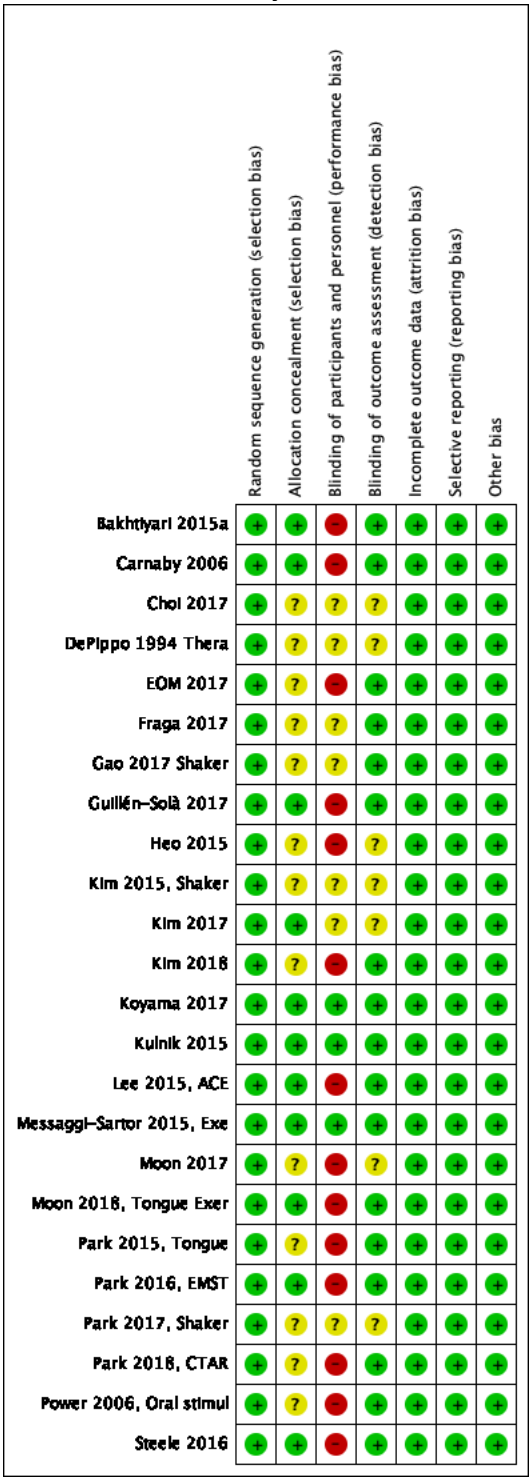
Risk of bias summary, Fluid thickening



2a. Behavioural interventions



Risk of bias summary, Behavioural Interventions



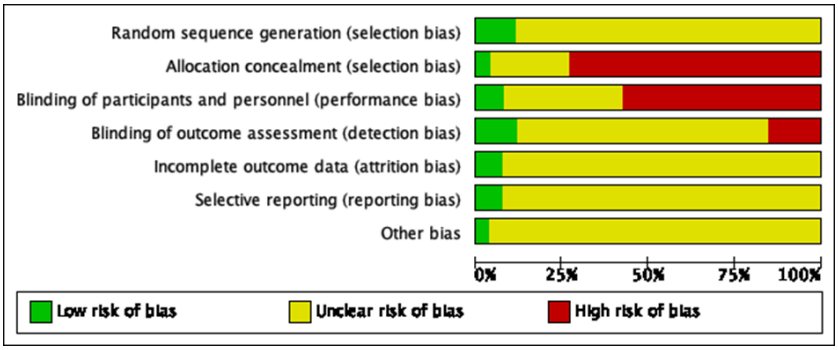
Risk of bias assessment of non-randomized studies using SIGN 50 checklist, Behavioural Interventions

	Internal validity														Overall
Author	**Conduct of study**	**Selection of subjects**					**Assessment**						**Confounding**	**Analysis**	**ROB**
	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	2.1
Kang 2012	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Kim 2015	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Li 2016	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Lin 2003	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable

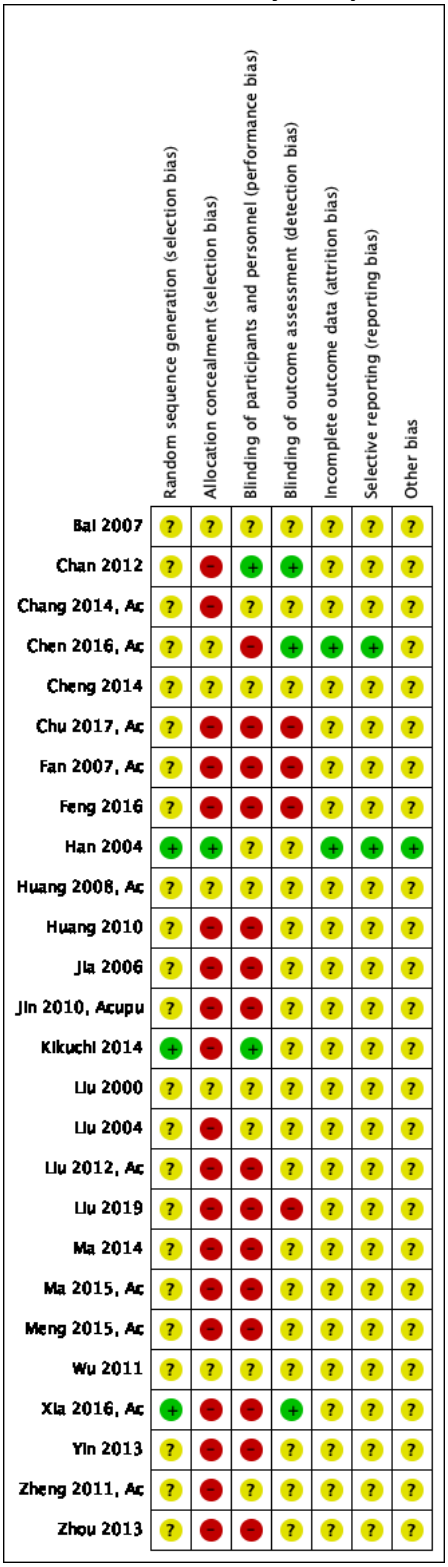
1.1: The study addresses an appropriate and clearly focused question; 1.2: The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation; 1.3: The study indicates how many of the people asked to take part did so, in each of the groups being studied; 1.4. The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis; 1.5: What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed; 1.6: Comparison is made between full participants and those lost to follow up, by exposure status; 1.7: The outcomes are clearly defined; 1.8: The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable; 1.9: Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome; 1.10: The method of assessment of exposure is reliable; 1.11: Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable; 1.12: Exposure level or prognostic factor is assessed more than once; 1.13: The main potential confounders are identified and taken into account in the design and analysis; 1.14: Have confidence intervals/p value been provided? 2.1: How well was the study done to minimise the risk of bias or confounding?
CS: Can't say, NA: Not applicable

2.b Acupuncture

Risk of Bias of RCT

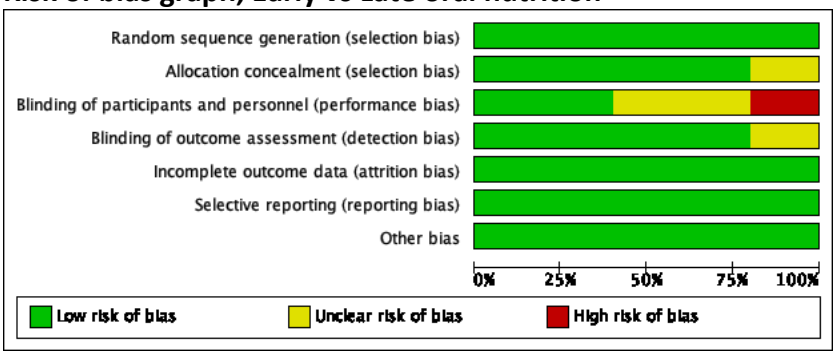


Risk of bias summary, Acupuncture

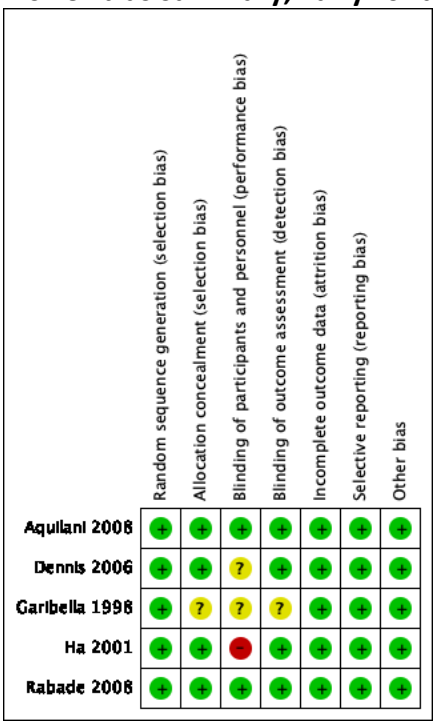


3. Nutritional Interventions

Risk of bias graph, Early vs Late oral nutrition

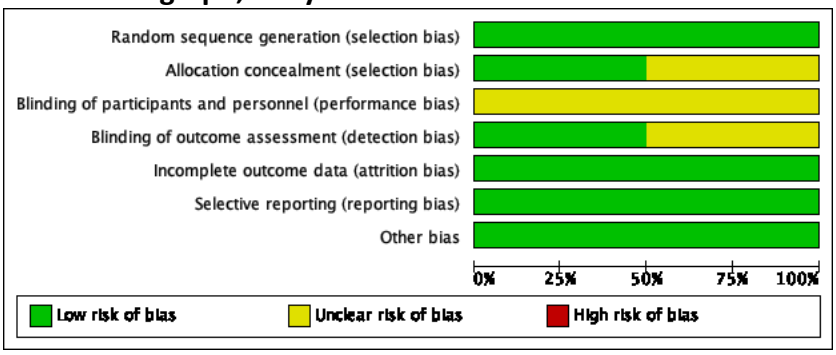


Risk of bias summary, Early vs Late oral nutrition

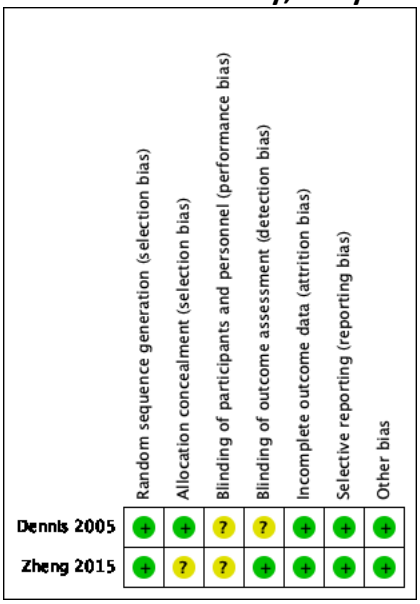


Risk of Bias of RCT

Risk of bias graph, Early vs Late Enteral or Parenteral Nutrition

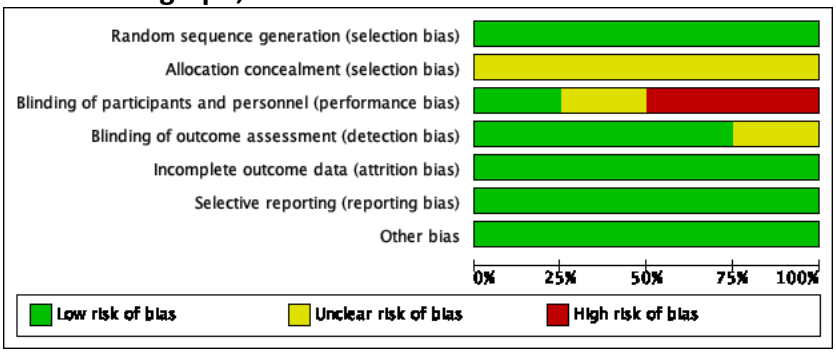


Risk of bias summary, Early vs Late Enteral or Parenteral Nutrition

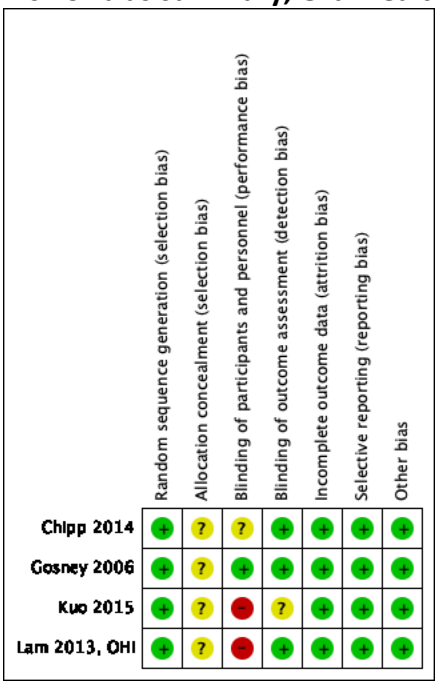


4. Oral Health Interventions

Risk of bias graph, Oral health



Risk of bias summary, Oral health



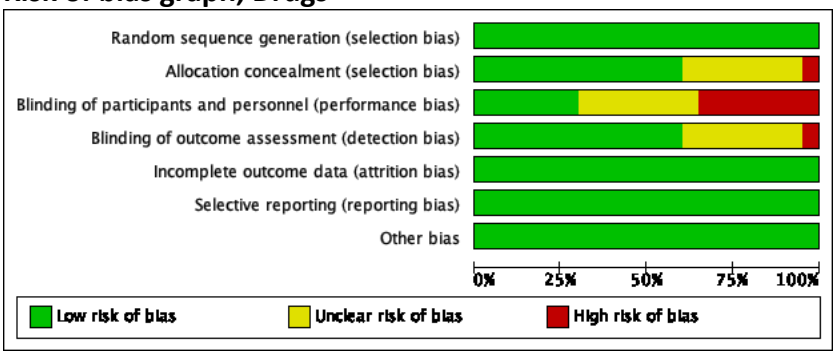
Risk of bias assessment of non-randomized studies using SIGN 50 checklist, Oral health

	Internal validity														Overall
Author	**Conduct of study**	**Selection of subjects**					**Assessment**						**Confounding**	**Analysis**	**ROB**
	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	2.1
Murray 2018	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Sørensen 2013	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Wagner 2016	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Talley 2015	Yes	CS	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	No	Yes	Acceptable

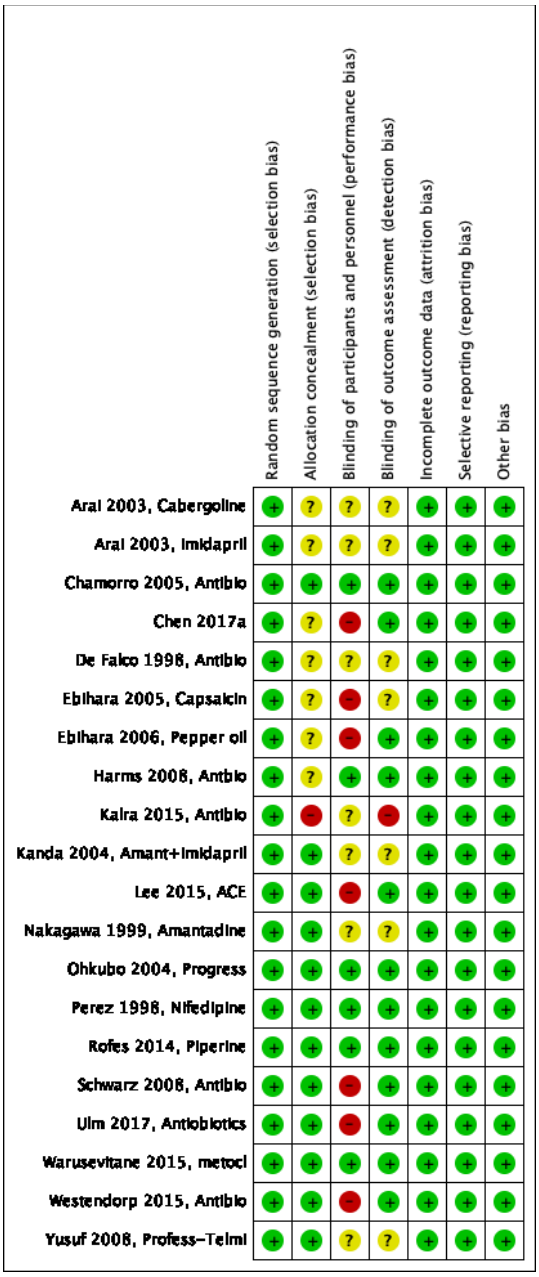
1.1: The study addresses an appropriate and clearly focused question; 1.2: The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation; 1.3: The study indicates how many of the people asked to take part did so, in each of the groups being studied; 1.4. The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis; 1.5: What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed; 1.6: Comparison is made between full participants and those lost to follow up, by exposure status; 1.7: The outcomes are clearly defined; 1.8: The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable; 1.9: Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome; 1.10: The method of assessment of exposure is reliable; 1.11: Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable; 1.12: Exposure level or prognostic factor is assessed more than once; 1.13: The main potential confounders are identified and taken into account in the design and analysis; 1.14: Have confidence intervals/p value been provided? 2.1: How well was the study done to minimise the risk of bias or confounding?
CS: Can't say, NA: Not applicable

5. Pharmacological Interventions

Risk of bias graph, Drugs



Risk of bias summary, Drugs


Random sequence generation (selection bias)
Allocation concealment (selection bias)
Blinding of participants and personnel (performance bias)
Blinding of outcome assessment (detection bias)
Incomplete outcome data (attrition bias)
Selective reporting (reporting bias)
Other bias
Aral 2003, Cabergoline
Aral 2003, Imidapril
Chamorro 2005, Antibio
Chen 2017a
De Falco 1998, Antibio
Ebihara 2005, Capsaicin
Ebihara 2006, Pepper oil
Harms 2008, Antbio
Kalra 2015, Antibio
Kanda 2004, Amant+Imidapril
Lee 2015, ACE
Nakagawa 1999, Amantadine
Ohkubo 2004, Progress
Perez 1998, Nifedipine
Rofes 2014, Piperine
Schwarz 2008, Antibio
Ulm 2017, Antiobiotics
Warusevitane 2015, metocl
Westendorp 2015, Antibio
Yusuf 2008, Profess-Telmi

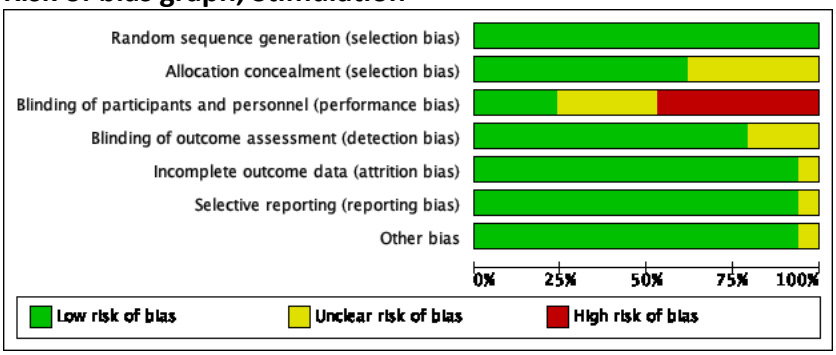
Risk of bias assessment of non-randomized studies using SIGN 50 checklist, Drugs

	Internal validity														Overall
Author	**Conduct of study**	**Selection of subjects**					**Assessment**						**Confounding**	**Analysis**	**ROB**
	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	2.1
Arai 2005	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Arai 2001	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Arai 1998	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Arai 2000	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Arai 1998	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Cuifang 2010	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Ebihara 1993	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Ebihara 2010	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Harda 2006	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable
Rofes 2013	Yes	Yes	NA	Yes	NA	NA	Yes	No	CS	Yes	Yes	NA	Yes	Yes	Acceptable

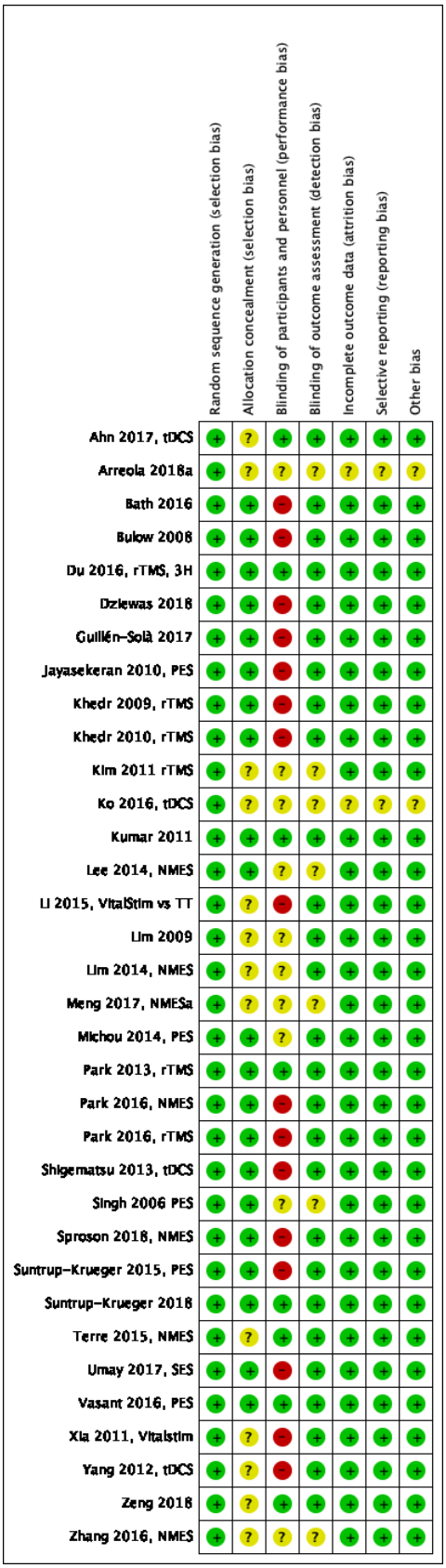
1.1: The study addresses an appropriate and clearly focused question; 1.2: The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation; 1.3: The study indicates how many of the people asked to take part did so, in each of the groups being studied; 1.4. The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis; 1.5: What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed; 1.6: Comparison is made between full participants and those lost to follow up, by exposure status; 1.7: The outcomes are clearly defined; 1.8: The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable; 1.9: Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome; 1.10: The method of assessment of exposure is reliable; 1.11: Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable; 1.12: Exposure level or prognostic factor is assessed more than once; 1.13: The main potential confounders are identified and taken into account in the design and analysis; 1.14: Have confidence intervals/p value been provided? 2.1: How well was the study done to minimise the risk of bias or confounding?
CS: Can't say, NA: Not applicable

6. Neurostimulation

Risk of bias graph, Stimulation



Risk of bias summary, Stimulation



Supplement 6: GRADE profiles

Epidemiology

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Dysphagia	No Dysphagia	Relative (95% CI)	Absolute (95% CI)		
Overall Mortality												
22	observational studies	not serious	serious [a]	not serious	not serious	very strong association	28314/142570 (19.9%)	9737/558898 (1.7%)	**OR 7.73** (4.68 to 12.76)	**103 more per 1,000** (from 59 more to 167 more)	⨁⨁⨁◯ MODERATE	CRITICAL
mRS 0-1												
2	observational studies	not serious	serious [a]	not serious	not serious	publication bias strongly suspected very strong association [b]	150/2514 (6.0%)	927/3068 (30.2%)	**OR 0.20** (0.11 to 0.35)	**222 fewer per 1,000** (from 257 fewer to 171 fewer)	⨁⨁◯◯ LOW	CRITICAL
Pneumonia												
33	observational studies	not serious	serious [a]	not serious	not serious	very strong association	35157/156312 (22.5%)	15345/610867 (2.5%)	**OR 7.45** (6.01 to 9.24)	**136 more per 1,000** (from 109 more to 167 more)	⨁⨁⨁◯ MODERATE	CRITICAL
Malnutrition												
9	observational studies	not serious	serious [a]	not serious	not serious	publication bias strongly suspected strong association [c]	218/952 (22.9%)	349/2842 (12.3%)	**OR 3.49** (1.82 to 6.69)	**205 more per 1,000** (from 80 more to 361 more)	⨁◯◯◯ VERY LOW	CRITICAL
Aspiration												
1	observational studies	not serious	not serious	not serious	not serious	publication bias strongly suspected strong association [b]	217/2457 (8.8%)	26/2687 (1.0%)	**OR 9.91** (6.58 to 14.95)	**79 more per 1,000** (from 51 more to 118 more)	⨁⨁◯◯ LOW	CRITICAL
Length of stay - Hospital												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Dysphagia	No Dysphagia	Relative (95% CI)	Absolute (95% CI)		
16	observational studies	not serious	serious [a]	not serious	not serious	publication bias strongly suspected [c]	141159	556455	-	MD **4.72 higher** (3.53 higher to 5.91 higher)	⨁◯◯◯ VERY LOW	IMPORTANT
Swallowing functions												
2	observational studies	not serious	not serious	not serious	not serious	publication bias strongly suspected strong association [c]	102	200	-	SMD **2.71 lower** (3.04 lower to 2.38 lower)	⨁⨁◯◯ LOW	IMPORTANT

CI: Confidence interval; **OR:** Odds ratio; **MD:** Mean difference

Explanations

a. I2 ≥ 75%
b. Wide confidence intervals
c. ≤ 8 studies for this outcome

Summary of findings:

Dysphagia compared to No Dysphagia for Stroke

Patient or population: Stroke
Setting:
Intervention: Dysphagia
Comparison: No Dysphagia

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with No Dysphagia	**Risk with Dysphagia**				
Overall Mortality	17 per 1,000	**121 per 1,000** (77 to 185)	**OR 7.73** (4.68 to 12.76)	701468 (22 observational studies)	⨁⨁⨁◯ MODERATE [a]	
mRS 0-1	302 per 1,000	**80 per 1,000** (45 to 132)	**OR 0.20** (0.11 to 0.35)	5582 (2 observational studies)	⨁⨁◯◯ LOW [a,b]	
Pneumonia	25 per 1,000	**161 per 1,000** (134 to 192)	**OR 7.45** (6.01 to 9.24)	767179 (33 observational studies)	⨁⨁⨁◯ MODERATE [a]	
Malnutrition	123 per 1,000	**328 per 1,000** (203 to 484)	**OR 3.49** (1.82 to 6.69)	3794 (9 observational studies)	⨁◯◯◯ VERY LOW [a,c]	
Aspiration	10 per 1,000	**88 per 1,000** (60 to 127)	**OR 9.91** (6.58 to 14.95)	5144 (1 observational study)	⨁⨁◯◯ LOW [b]	
Length of stay - Hospital	The mean length of stay - Hospital was **0**	MD **4.72 higher** (3.53 higher to 5.91 higher)	-	697614 (16 observational studies)	⨁◯◯◯ VERY LOW [a,c]	
Swallowing functions	-	SMD **2.71 lower** (3.04 lower to 2.38 lower)	-	302 (2 observational studies)	⨁⨁◯◯ LOW [c]	

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

CI: Confidence interval; **OR:** Odds ratio; **MD:** Mean difference; **SMD:** Standardised mean difference

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

Explanations

a. I2 ≥ 75%
b. ≤ 2 studies to report this outcome
c. Publication bias suspected

Screening

Screening compared to No screening

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Screening	No screening	Relative (95% CI)	Absolute (95% CI)		
Mortality												
8	observational studies	not serious	serious [a]	not serious	serious [b]	publication bias strongly suspected [c]	6192/70974 (8.7%)	3217/15994 (20.1%)	**OR 0.59** (0.25 to 1.38)	**72 fewer per 1,000** (from 142 fewer to 57 more)	⨁◯◯◯ VERY LOW	CRITICAL
Pneumonia												
12	observational studies	not serious	serious [a]	not serious	not serious	none	25413/357102 (7.1%)	17537/179548 (9.8%)	**OR 0.55** (0.36 to 0.83)	**41 fewer per 1,000** (from 60 fewer to 15 fewer)	⨁◯◯◯ VERY LOW	CRITICAL
Length of stay in hospital												
5	observational studies	not serious	serious [a]	not serious	serious [b]	publication bias strongly suspected [c]	14512	6493	-	MD **0.02 higher** (2.22 lower to 2.26 higher)	⨁◯◯◯ VERY LOW	IMPORTANT
Tube - Nasogastric tube insertion												
3	observational studies	not serious	not serious	not serious	serious [b]	publication bias strongly suspected [c]	117/265 (44.2%)	102/194 (52.6%)	**OR 0.86** (0.51 to 1.45)	**38 fewer per 1,000** (from 165 fewer to 91 more)	⨁◯◯◯ VERY LOW	NOT IMPORTANT

CI: Confidence interval; **OR:** Odds ratio; **MD:** Mean difference

Explanations

a. I2 ≥ 75%
b. Wide confidence intervals
c. ≤ 8 studies for this outcome

Summary of findings:

Screening compared to No screening for Dysphagia after stroke

Patient or population: Dysphagia after stroke
Setting:
Intervention: Screening
Comparison: No screening

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with No screening	**Risk with Screening**				
Mortality	201 per 1,000	**129 per 1,000** (59 to 258)	**OR 0.59** (0.25 to 1.38)	86968 (8 observational studies)	⨁◯◯◯ VERY LOW [a,b,c]	
Pneumonia	98 per 1,000	**56 per 1,000** (38 to 82)	**OR 0.55** (0.36 to 0.83)	536650 (12 observational studies)	⨁◯◯◯ VERY LOW [a]	
Length of stay in hospital	The mean length of stay in hospital was **0**	MD **0.02 higher** (2.22 lower to 2.26 higher)	-	21005 (5 observational studies)	⨁◯◯◯ VERY LOW [a,b,c]	
Tube - Nasogastric tube insertion	526 per 1,000	**488 per 1,000** (361 to 617)	**OR 0.86** (0.51 to 1.45)	459 (3 observational studies)	⨁◯◯◯ VERY LOW [b,c]	

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

CI: Confidence interval; **OR:** Odds ratio; **MD:** Mean difference

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

Explanations

a. I2 ≥ 75%
b. Wide confidence intervals
c. ≤ 8 studies for this outcome

Early Screening compared to Late Screening

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Early screening	Late screening	Relative (95% CI)	Absolute (95% CI)		
Mortality												
7	observational studies	not serious	serious [a]	not serious	not serious	publication bias strongly suspected [b]	11606/80014 (14.5%)	14961/64293 (23.3%)	**OR 0.62** (0.43 to 0.91)	**74 fewer per 1,000** (from 117 fewer to 16 fewer)	⨁◯◯◯ VERY LOW	CRITICAL
mRS - 4-5												
1	observational studies	not serious	not serious	not serious	not serious	publication bias strongly suspected [b]	731/2647 (27.6%)	259/662 (39.1%)	**OR 0.59** (0.50 to 0.71)	**116 fewer per 1,000** (from 148 fewer to 78 fewer)	⨁◯◯◯ VERY LOW	CRITICAL
Pneumonia												
10	observational studies	not serious	serious [a]	not serious	not serious	publication bias strongly suspected strong association [c]	5863/61967 (9.5%)	5305/34400 (15.4%)	**OR 0.45** (0.35 to 0.58)	**78 fewer per 1,000** (from 94 fewer to 59 fewer)	⨁◯◯◯ VERY LOW	CRITICAL
Length of stay in hospital												
6	observational studies	not serious	serious [a]	not serious	not serious	publication bias strongly suspected [b]	24176	31909	-	MD **2.27 lower** (3.12 lower to 1.43 lower)	⨁◯◯◯ VERY LOW	IMPORTANT
QOL												
1	observational studies	not serious	not serious	not serious	serious [d]	publication bias strongly suspected [b]	1/89 (1.1%)	0/49 (0.0%)	**OR 1.68** (0.07 to 41.97)	**0 fewer per 1,000** (from 0 fewer to 0 fewer)	⨁◯◯◯ VERY LOW	IMPORTANT
Feeding tube - Nasogastric tube												
2	observational studies	not serious	not serious	not serious	serious [d]	publication bias strongly suspected [b]	22/58 (37.9%)	46/88 (52.3%)	**OR 0.52** (0.26 to 1.04)	**160 fewer per 1,000** (from 301 fewer to 10 more)	⨁◯◯◯ VERY LOW	NOT IMPORTANT

CI: Confidence interval; **OR:** Odds ratio; **MD:** Mean difference

Summary of findings:

Early screening compared to Late screening for Dysphagia after stroke

Patient or population: Dysphagia after stroke
Setting:
Intervention: Early screening
Comparison: Late screening

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with Late screening	**Risk with Early screening**				
Mortality	233 per 1,000	**158 per 1,000** (115 to 216)	**OR 0.62** (0.43 to 0.91)	144307 (7 observational studies)	⨁◯◯◯ VERY LOW [a,b]	
mRS - 4-5	391 per 1,000	**275 per 1,000** (243 to 313)	**OR 0.59** (0.50 to 0.71)	3309 (1 observational study)	⨁◯◯◯ VERY LOW [b]	
Pneumonia	154 per 1,000	**76 per 1,000** (60 to 96)	**OR 0.45** (0.35 to 0.58)	96367 (10 observational studies)	⨁◯◯◯ VERY LOW [a,c]	
Length of stay in hospital	The mean length of stay in hospital was **0**	MD **2.27 lower** (3.12 lower to 1.43 lower)	-	56085 (6 observational studies)	⨁◯◯◯ VERY LOW [a,b]	
QOL	0 per 1,000	**0 per 1,000** (0 to 0)	**OR 1.68** (0.07 to 41.97)	138 (1 observational study)	⨁◯◯◯ VERY LOW [b,d]	
Feeding tube - Nasogastric tube	523 per 1,000	**363 per 1,000** (222 to 533)	**OR 0.52** (0.26 to 1.04)	146 (2 observational studies)	⨁◯◯◯ VERY LOW [b,d]	

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

CI: Confidence interval; **OR:** Odds ratio; **MD:** Mean difference

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

Explanations

a. I2 ≥ 75%
b. ≤ 7 studies to report this outcome
c. Asymmetry of the Funnel plot
d. Wide confidence intervals

3. Assessment

Early compared to Late Assessment

Certainty assessment							Impact	Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Pneumonia									
2	observational studies	not serious	not serious	not serious	not serious	publication bias strongly suspected [a]	Bray 2017: 24,542 patients • ~60% less with Early compared to Late assessment • OR: 0.60 (0.40-0.78) at < 6 hr vs 6-24 hr, p < 0.001 • OR: 0.40 (0.16-0.59) at < 6 hr vs 24-48 hr, p < 0.001 Dhufaigh 2017: 135 patients • 12.8 vs 26.5%, OR: 0.41 (0.17, 0.99), p < 0.05	⨁◯◯◯ VERY LOW	CRITICAL
Dysphagia improvement									
1	observational studies	not serious	not serious	not serious	not serious	publication bias strongly suspected [a]	1.5 vs 0.6 in Early vs Late assessment	⨁◯◯◯ VERY LOW	IMPORTANT

CI: Confidence interval

Explanations

a. Two or less studies for this outcome

Clinical Assessment compared to Instrumental Assessment

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Clinical Bedside	Instrument	Relative (95% CI)	Absolute (95% CI)		
Mortality												
1	observational studies	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	23/220 (10.5%)	16/220 (7.3%)	**OR 1.49** (0.76 to 2.90)	**32 more per 1,000** (from 16 fewer to 113 more)	⨁◯◯◯ VERY LOW	CRITICAL
Pneumonia												
1	observational studies	not serious	not serious	not serious	not serious	publication bias strongly suspected strong association [b]	27/220 (12.3%)	14/220 (6.4%)	**OR 2.06** (1.05 to 4.04)	**59 more per 1,000** (from 3 more to 152 more)	⨁⨁◯◯ LOW	CRITICAL
LOS												
1	observational studies	not serious	not serious	not serious	not serious	publication bias strongly suspected [b]	220	220	-	MD **6.33 lower** (9.67 lower to 2.99 lower)	⨁◯◯◯ VERY LOW	IMPORTANT

CI: Confidence interval; **OR:** Odds ratio; **MD:** Mean difference

Explanations

a. Wide confidence intervals
b. One study to report this outcome

Summary of findings:

Clinical Assessment compared to Instrumental Assessment

Patient or population: Stroke
Setting:
Intervention: Clinical Bedside
Comparison: Instrument

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with Instrument	**Risk with Clinical Bedside**				
Mortality	73 per 1,000	**105 per 1,000** (56 to 185)	**OR 1.49** (0.76 to 2.90)	440 (1 observational study)	⨁◯◯◯ VERY LOW [a,b]	
Pneumonia	64 per 1,000	**123 per 1,000** (67 to 215)	**OR 2.06** (1.05 to 4.04)	440 (1 observational study)	⨁⨁◯◯ LOW [b]	
LOS	The mean LOS was **0**	MD **6.33 lower** (9.67 lower to 2.99 lower)	-	440 (1 observational study)	⨁◯◯◯ VERY LOW [b]	

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

CI: Confidence interval; **OR:** Odds ratio; **MD:** Mean difference

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

Explanations

a. Wide confidence intervals
b. One study to report this outcome

Instrumental assessment with FEES compared to VFSS

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	instrumental assessment with VFSS	FEES	Relative (95% CI)	Absolute (95% CI)		
Pneumonia												
1	observational studies	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	7/24 (29.2%)	1/21 (4.8%)	**OR 8.24** (0.92 to 73.79)	**244 more per 1,000** (from 4 fewer to 739 more)	⨁◯◯◯ VERY LOW	CRITICAL
Complications - PEG												
1	observational studies	not serious	not serious	not serious	not serious	publication bias strongly suspected strong association [b]	2/78 (2.6%)	17/61 (27.9%)	**OR 0.07** (0.02 to 0.31)	**252 fewer per 1,000** (from 271 fewer to 172 fewer)	⨁⨁◯◯ LOW	NOT IMPORTANT

CI: Confidence interval; **OR:** Odds ratio

Explanations

a. Wide confidence intervals
b. One study to support the outcome

Summary of findings:

Instrumental assessment with VFSS compared to FEES

Patient or population: Dysphagia after stroke
Setting:
Intervention: instrumental assessment with VFSS
Comparison: FEES

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with FEES	**Risk with instrumental assessment with VFSS**				
Pneumonia	48 per 1,000	**292 per 1,000** (44 to 787)	**OR 8.24** (0.92 to 73.79)	45 (1 observational study)	⨁◯◯◯ VERY LOW [a,b]	
Complications - PEG	279 per 1,000	**26 per 1,000** (8 to 107)	**OR 0.07** (0.02 to 0.31)	139 (1 observational study)	⨁⨁◯◯ LOW [b]	

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

CI: Confidence interval; **OR:** Odds ratio

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

Explanations

a. Wide confidence intervals
b. One study to support the outcome

Complementary assessments in addition to clinical standard assessment (i.e. spirometry, EMG) compared to standard clinical assessment

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	complementary assessments to clinical assessmstandard clinical assessments (i.e. spirometry, EMG)	standard clinical assessment	Relative (95% CI)	Absolute (95% CI)		
Mortality												
1	observational studies	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	20/148 (13.5%)	32/163 (19.6%)	**OR 0.64** (0.35 to 1.18)	**61 fewer per 1,000** (from 118 fewer to 27 more)	⨁◯◯◯ VERY LOW	
Pneumonia												
1	observational studies	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	38/148 (25.7%)	35/163 (21.5%)	**OR 1.26** (0.75 to 2.14)	**42 more per 1,000** (from 45 fewer to 154 more)	⨁◯◯◯ VERY LOW	
Length of stay												
1	observational studies	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	148	163	-	MD **1 higher** (0.16 lower to 2.16 higher)	⨁◯◯◯ VERY LOW	
FOIS												
1	observational studies	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	148	163	-	MD **0.2 higher** (0.08 lower to 0.48 higher)	⨁◯◯◯ VERY LOW	

CI: Confidence interval; **OR:** Odds ratio; **MD:** Mean difference

Explanations

a. Wide Confidence intervals
b. Single study to report this outcome

Summary of findings:

Complementary assessments in addition to clinical standard assessment (i.e. spirometry, EMG) compared to standard clinical assessment for Dysphagia after stroke

Patient or population: Dysphagia after stroke
Setting:
Intervention: complementary assessments to clinical assessmstandard clinical assessment ents (i.e. spirometry, EMG)
Comparison: standard clinical assessment

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with standard clinical assessment	**Risk with complementary assessments to clinical assessmstandard clinical assessment ents (i.e. spirometry, EMG)**				
Mortality	196 per 1,000	**135 per 1,000** (79 to 224)	**OR 0.64** (0.35 to 1.18)	311 (1 observational study)	⨁◯◯◯ VERY LOW [a,b]	
Pneumonia	215 per 1,000	**256 per 1,000** (170 to 369)	**OR 1.26** (0.75 to 2.14)	311 (1 observational study)	⨁◯◯◯ VERY LOW [a,b]	
Length of stay	The mean length of stay was **0**	MD **1 higher** (0.16 lower to 2.16 higher)	-	311 (1 observational study)	⨁◯◯◯ VERY LOW [a,b]	
FOIS	The mean FOIS was **0**	MD **0.2 higher** (0.08 lower to 0.48 higher)	-	311 (1 observational study)	⨁◯◯◯ VERY LOW [a,b]	

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

CI: Confidence interval; **OR:** Odds ratio; **MD:** Mean difference

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

Explanations

a. Wide Confidence intervals
b. Single study to report this outcome

4. Treatment

4.1 Dietary Interventions

TEXTURE MODIFICATION

Author(s):
Question: Texture modification compared to Control in Dysphagia after stroke
Setting:
Bibliography:

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Texture modification	Control	Relative (95% CI)	Absolute (95% CI)		
Mortality												
1	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	37/204 (18.1%)	23/102 (22.5%)	**RR 0.80** (0.51 to 1.28)	**45 fewer per 1,000** (from 110 fewer to 63 more)	⨁⨁◯◯ LOW	CRITICAL
Rankin ≥3												
1	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	103/204 (50.5%)	49/102 (48.0%)	**RR 1.05** (0.82 to 1.34)	**24 more per 1,000** (from 86 fewer to 163 more)	⨁⨁◯◯ LOW	CRITICAL
Pneumonia												
1	randomised trials	not serious	not serious	not serious	not serious	publication bias strongly suspected [b]	54/204 (26.5%)	48/102 (47.1%)	**RR 0.56** (0.41 to 0.77)	**207 fewer per 1,000** (from 278 fewer to 108 fewer)	⨁⨁⨁◯ MODERATE	CRITICAL
Functional swallowing												
1	randomised trials	not serious	not serious	not serious	not serious	publication bias strongly suspected [b]	93/204 (45.6%)	33/102 (32.4%)	**RR 1.41** (1.03 to 1.94)	**133 more per 1,000** (from 10 more to 304 more)	⨁⨁⨁◯ MODERATE	IMPORTANT
Length of stay in hospital												
1	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	204	102	-	MD **2.25 lower** (4.66 lower to 0.16 higher)	⨁⨁◯◯ LOW	IMPORTANT

CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference

Explanations

a. Wide confidence intervals
b. One study to report this outcome

Summary of findings:

Texture modification compared to Control in Dysphagia after stroke

Patient or population: Dysphagia after stroke
Setting:
Intervention: Texture modification
Comparison: Control

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with Control	**Risk with Texture modification**				
Mortality	225 per 1,000	**180 per 1,000** (115 to 289)	**RR 0.80** (0.51 to 1.28)	306 (1 RCT)	⨁⨁◯◯ LOW [a,b]	
Rankin ≥3	480 per 1,000	**504 per 1,000** (394 to 644)	**RR 1.05** (0.82 to 1.34)	306 (1 RCT)	⨁⨁◯◯ LOW [a,b]	
Pneumonia	471 per 1,000	**264 per 1,000** (193 to 362)	**RR 0.56** (0.41 to 0.77)	306 (1 RCT)	⨁⨁⨁◯ MODERATE [b]	
Functional swallowing	324 per 1,000	**456 per 1,000** (333 to 628)	**RR 1.41** (1.03 to 1.94)	306 (1 RCT)	⨁⨁⨁◯ MODERATE [b]	
Length of stay in hospital	The mean length of stay in hospital was **0**	MD **2.25 lower** (4.66 lower to 0.16 higher)	-	306 (1 RCT)	⨁⨁◯◯ LOW [a,b]	

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

CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference

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

Explanations

a. Wide confidence intervals
b. One study to report this outcome

FLUID THICKENING

Author(s):
Question: Fluid thickening compared to Control in Dysphagia after stroke
Setting:
Bibliography:

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Fluid thickening	Control	Relative (95% CI)	Absolute (95% CI)		
Pneumonia												
3	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	0/35 (0.0%)	13/65 (20.0%)	**RR 0.19** (0.03 to 1.40)	**162 fewer per 1,000** (from 194 fewer to 80 more)	⨁⨁◯◯ LOW	CRITICAL
Dysphagia												
1	randomised trials	not serious	not serious	not serious	not serious	publication bias strongly suspected [b]	6/18 (33.3%)	39/46 (84.8%)	**RR 0.40** (0.20 to 0.77)	**509 fewer per 1,000** (from 678 fewer to 195 fewer)	⨁⨁⨁◯ MODERATE	IMPORTANT
LOS in Hospital, days												
1	randomised trials	not serious	not serious	not serious	not serious	publication bias strongly suspected [b]	18	46	-	MD **9.58 lower** (15.41 lower to 3.76 lower)	⨁⨁⨁◯ MODERATE	IMPORTANT
Tests - Albumin												
1	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	18	46	-	MD **0.3 higher** (3.94 lower to 4.55 higher)	⨁⨁◯◯ LOW	IMPORTANT

CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference

Explanations

a. Wide confidence intervals
b. ≤ 3 studies to report this outcome

Summary of findings:

Fluid thickening compared to Control in Dysphagia after stroke

Patient or population: Dysphagia after stroke
Setting:
Intervention: Fluid thickening
Comparison: Control

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with Control	**Risk with Fluid thickening**				
Pneumonia	200 per 1,000	**38 per 1,000** (6 to 280)	**RR 0.19** (0.03 to 1.40)	100 (3 RCTs)	⨁⨁◯◯ LOW [a,b]	
Dysphagia	848 per 1,000	**339 per 1,000** (170 to 653)	**RR 0.40** (0.20 to 0.77)	64 (1 RCT)	⨁⨁⨁◯ MODERATE [b]	
LOS in Hospital, days	The mean LOS in Hospital, days was **0**	MD **9.58 lower** (15.41 lower to 3.76 lower)	-	64 (1 RCT)	⨁⨁⨁◯ MODERATE [b]	
Tests - Albumin	The mean tests - Albumin was **0**	MD **0.3 higher** (3.94 lower to 4.55 higher)	-	64 (1 RCT)	⨁⨁◯◯ LOW [a,b]	

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

CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference

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

Explanations

a. Wide confidence intervals
b. ≤ 3 studies to report this outcome

4.2 Behavioural Interventions

Author(s):
Question: Behavioural compared to Control in Dysphagia after stroke
Setting:
Bibliography:

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Behavioural	Control	Relative (95% CI)	Absolute (95% CI)		
Mortality												
3	randomised trials	not serious	serious [a]	not serious	serious [b]	publication bias strongly suspected [c]	41/271 (15.1%)	25/234 (10.7%)	**RR 1.47** (0.32 to 6.78)	**50 more per 1,000** (from 73 fewer to 618 more)	⨁◯◯◯ VERY LOW	CRITICAL
mRS, ≥3												
1	randomised trials	not serious	not serious	not serious	serious [b]	publication bias strongly suspected [c]	103/204 (50.5%)	49/102 (48.0%)	**RR 1.05** (0.82 to 1.34)	**24 more per 1,000** (from 86 fewer to 163 more)	⨁⨁◯◯ LOW	CRITICAL
Pneumonia												
6	randomised trials	not serious	not serious	not serious	not serious	publication bias strongly suspected [c]	69/375 (18.4%)	74/302 (24.5%)	**RR 0.57** (0.43 to 0.75)	**105 fewer per 1,000** (from 140 fewer to 61 fewer)	⨁⨁⨁◯ MODERATE	CRITICAL
Dysphagia, improvement												
16	randomised trials	not serious	serious [a]	not serious	not serious	none	235	205	-	MD **1.09 higher** (0.7 higher to 1.47 higher)	⨁⨁⨁◯ MODERATE	IMPORTANT
Length of stay												
1	randomised trials	not serious	not serious	not serious	serious [b]	publication bias strongly suspected [c]	204	102	-	MD **2.2 lower** (4.61 lower to 0.21 higher)	⨁⨁◯◯ LOW	IMPORTANT
QOL, Change												
1	randomised trials	not serious	not serious	not serious	serious [b]	publication bias strongly suspected [c]	8	8	-	SMD **0.58 higher** (0.43 lower to 1.58 higher)	⨁⨁◯◯ LOW	IMPORTANT

CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference; **SMD:** Standardised mean difference

Explanations

a. I2 ≥ 65%
b. Wide confidence intervals
c. ≤ 7 studies to report this outcome

Summary of findings:

Behavioural compared to Control in Dysphagia after stroke

Patient or population: Dysphagia after stroke
Setting:
Intervention: Behavioural
Comparison: Control

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with Control	**Risk with Behavioural**				
Mortality	107 per 1,000	**157 per 1,000** (34 to 724)	**RR 1.47** (0.32 to 6.78)	505 (3 RCTs)	⨁◯◯◯ VERY LOW [a,b,c]	
mRS, ≥3	480 per 1,000	**504 per 1,000** (394 to 644)	**RR 1.05** (0.82 to 1.34)	306 (1 RCT)	⨁⨁◯◯ LOW [b,c]	
Pneumonia	245 per 1,000	**140 per 1,000** (105 to 184)	**RR 0.57** (0.43 to 0.75)	677 (6 RCTs)	⨁⨁⨁◯ MODERATE [c]	
Dysphagia, improvement	The mean dysphagia, improvement was **0**	MD **1.09 higher** (0.7 higher to 1.47 higher)	-	440 (16 RCTs)	⨁⨁⨁◯ MODERATE [a]	
Length of stay	The mean length of stay was **0**	MD **2.2 lower** (4.61 lower to 0.21 higher)	-	306 (1 RCT)	⨁⨁◯◯ LOW [b,c]	
QOL, Change	-	SMD **0.58 higher** (0.43 lower to 1.58 higher)	-	16 (1 RCT)	⨁⨁◯◯ LOW [b,c]	

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

CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference; **SMD:** Standardised mean difference

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

Explanations

a. I2 ≥ 65%
b. Wide confidence intervals
c. ≤ 7 studies to report this outcome

ACUPUNCTURE

Author(s):
Question: Acupuncture compared to Control in Dysphagia after stroke
Setting:
Bibliography:

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Acupuncture	Control	Relative (95% CI)	Absolute (95% CI)		
Pneumonia												
1	randomised trials	serious [a]	serious [b]	not serious	serious [c]	publication bias strongly suspected [d]	2/60 (3.3%)	5/60 (8.3%)	**RR 0.40** (0.08 to 1.98)	**50 fewer per 1,000** (from 77 fewer to 82 more)	⨁◯◯◯ VERY LOW	CRITICAL
Dyaphagia at end												
23	randomised trials	serious [a]	not serious	not serious	not serious	none	234/1169 (20.0%)	399/1008 (39.6%)	**RR 0.51** (0.41 to 0.63)	**194 fewer per 1,000** (from 234 fewer to 146 fewer)	⨁⨁⨁◯ MODERATE	IMPORTANT
Quality of life												
1	randomised trials	not serious	not serious	not serious	not serious	publication bias strongly suspected [d]	60	60	-	MD **32 higher** (24.99 higher to 39.01 higher)	⨁⨁⨁◯ MODERATE	IMPORTANT
Nasal feeding tube removal												
1	randomised trials	serious [a]	not serious	not serious	not serious	publication bias strongly suspected [d]	34/38 (89.5%)	18/36 (50.0%)	**RR 1.79** (1.27 to 2.53)	**395 more per 1,000** (from 135 more to 765 more)	⨁⨁◯◯ LOW	NOT IMPORTANT

CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference

Explanations

a. Not assessed due to lack of information
b.I2 = 69%
c. Wide confidence intervals
d. 1 study to report this outcome

Summary of findings:

Acupuncture compared to Control in Dysphagia after stroke

Patient or population: Dysphagia after stroke
Setting:
Intervention: Acupuncture
Comparison: Control

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with Control	Risk with Acupuncture				
Pneumonia	83 per 1,000	**33 per 1,000** (7 to 165)	**RR 0.40** (0.08 to 1.98)	120 (1 RCT)	⨁◯◯◯ VERY LOW [a,b,c,d]	
Dyaphagia at end	408 per 1,000	**208 per 1,000** (184 to 237)	**RR 0.51** (0.45 to 0.58)	1993 (21 RCTs)	⨁⨁◯◯ LOW [a,d]	
Quality of life	The mean quality of life was **0**	MD **32 higher** (24.99 higher to 39.01 higher)	-	120 (1 RCT)	⨁⨁⨁◯ MODERATE [d]	
Nasal feeding tube removal	500 per 1,000	**895 per 1,000** (635 to 1,000)	**RR 1.79** (1.27 to 2.53)	74 (1 RCT)	⨁⨁◯◯ LOW [a,d]	

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

CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference

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

Explanations

a. Not assessed due to lack of information
b. I2 = 69%
c. Wide confidence intervals
d. 1 study to report this outcome

4.3 Nutritional Interventions

EARLY VS LATE NUTRITION

Author(s):
Question: Early nutrition compared to Late nutrition in Dysphagia after stroke
Setting:
Bibliography:

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Early nutrition	Late nutrition	Relative (95% CI)	Absolute (95% CI)		
Mortality												
4	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	255/2172 (11.7%)	272/2165 (12.6%)	**RR 0.88** (0.57 to 1.37)	**15 fewer per 1,000** (from 54 fewer to 46 more)	⨁⨁◯◯ LOW	CRITICAL
Pneumonia												
1	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	130/2016 (6.4%)	116/2007 (5.8%)	**RR 1.12** (0.88 to 1.42)	**7 more per 1,000** (from 7 fewer to 24 more)	⨁⨁◯◯ LOW	CRITICAL
mRS 0, 1												
1	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	472/2016 (23.4%)	472/2007 (23.5%)	**RR 1.00** (0.89 to 1.11)	**0 fewer per 1,000** (from 26 fewer to 26 more)	⨁⨁◯◯ LOW	CRITICAL
Length of stay in hospital												
4	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	2145	2144	-	MD **0.93 higher** (1.05 lower to 2.91 higher)	⨁⨁◯◯ LOW	IMPORTANT
Weight												
4	randomised trials	not serious	not serious	not serious	not serious	publication bias strongly suspected [b]	153	162	-	MD **1.03 higher** (0.17 higher to 1.89 higher)	⨁⨁⨁◯ MODERATE	IMPORTANT

CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference

Explanations

a. Wide confidence intervals
b. ≤ 4 studies to report this outcome

Summary of findings:

Early nutrition compared to Late nutrition in Dysphagia after stroke

Patient or population: Dysphagia after stroke
Setting:
Intervention: Early nutrition
Comparison: Late nutrition

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with Late nutrition	**Risk with Early nutrition**				
Mortality	126 per 1,000	**111 per 1,000** (72 to 172)	**RR 0.88** (0.57 to 1.37)	4337 (4 RCTs)	⨁⨁◯◯ LOW [a,b]	
Pneumonia	58 per 1,000	**65 per 1,000** (51 to 82)	**RR 1.12** (0.88 to 1.42)	4023 (1 RCT)	⨁⨁◯◯ LOW [a,b]	
mRS 0, 1	235 per 1,000	**235 per 1,000** (209 to 261)	**RR 1.00** (0.89 to 1.11)	4023 (1 RCT)	⨁⨁◯◯ LOW [a,b]	
Length of stay in hospital	The mean length of stay in hospital was **0**	MD **0.93 higher** (1.05 lower to 2.91 higher)	-	4289 (4 RCTs)	⨁⨁◯◯ LOW [a,b]	
Weight	The mean weight was **0**	MD **1.03 higher** (0.17 higher to 1.89 higher)	-	315 (4 RCTs)	⨁⨁⨁◯ MODERATE [b]	

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

CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference

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

Explanations

a. Wide confidence intervals
b. ≤ 4 studies to report this outcome

EARLY ENTERAL OR PARENTRAL NUTRITION VS RESTRICITVE

Author(s):
Question: Early enteral or parenteral nutrition compared to Control for Dysphagia after stroke
Setting:
Bibliography:

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Early enteral or parenteral nutrition	Control	Relative (95% CI)	Absolute (95% CI)		
Mortality												
1	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	182/429 (42.4%)	207/430 (48.1%)	**RR 0.88** (0.76 to 1.02)	**58 fewer per 1,000** (from 116 fewer to 10 more)	⨁⨁◯◯ LOW	CRITICAL
Pneumonia												
2	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [a]	143/504 (28.4%)	148/501 (29.5%)	**RR 0.97** (0.80 to 1.17)	**9 fewer per 1,000** (from 59 fewer to 50 more)	⨁⨁◯◯ LOW	CRITICAL
mRS 0, 1												
2	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	28/495 (5.7%)	34/486 (7.0%)	**RR 0.84** (0.36 to 1.94)	**11 fewer per 1,000** (from 45 fewer to 66 more)	⨁⨁◯◯ LOW	CRITICAL
Malnutrition												
1	randomised trials	not serious	not serious	not serious	not serious	publication bias strongly suspected [b]	19/70 (27.1%)	28/58 (48.3%)	**RR 0.56** (0.35 to 0.90)	**212 fewer per 1,000** (from 314 fewer to 48 fewer)	⨁⨁⨁◯ MODERATE	CRITICAL
Length of stay in hospital												
1	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	429	430	-	MD **1 higher** (6.24 lower to 8.24 higher)	⨁⨁◯◯ LOW	IMPORTANT

CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference

Explanations

a. Wide confidence intervals
b. ≤ 2 studies to report this outcome

Summary of findings:

Early enteral or parenteral nutrition compared to Control for Dysphagia after stroke

Patient or population: Dysphagia after stroke
Setting:
Intervention: Early enteral or parenteral nutrition
Comparison: Control

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with Control	**Risk with Early enteral or parenteral nutrition**				
Mortality	481 per 1,000	**424 per 1,000** (366 to 491)	**RR 0.88** (0.76 to 1.02)	859 (1 RCT)	⨁⨁◯◯ LOW [a,b]	
Pneumonia	295 per 1,000	**287 per 1,000** (236 to 346)	**RR 0.97** (0.80 to 1.17)	1005 (2 RCTs)	⨁⨁◯◯ LOW [a]	
mRS 0, 1	70 per 1,000	**59 per 1,000** (25 to 136)	**RR 0.84** (0.36 to 1.94)	981 (2 RCTs)	⨁⨁◯◯ LOW [a,b]	
Malnutrition	483 per 1,000	**270 per 1,000** (169 to 434)	**RR 0.56** (0.35 to 0.90)	128 (1 RCT)	⨁⨁⨁◯ MODERATE [b]	
Length of stay in hospital	The mean length of stay in hospital was **0**	MD **1 higher** (6.24 lower to 8.24 higher)	-	859 (1 RCT)	⨁⨁◯◯ LOW [a,b]	

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

CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference

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

Explanations

a. Wide confidence intervals
b. ≤ 2 studies to report this outcome

4.4 Oral Health Interventions

Author(s):
Question: Oral health compared to Control in Dysphagia after stroke
Setting:
Bibliography:

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Oral health	Control	Relative (95% CI)	Absolute (95% CI)		
Mortality												
1	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	9/103 (8.7%)	14/100 (14.0%)	**RR 0.62** (0.28 to 1.38)	**53 fewer per 1,000** (from 101 fewer to 53 more)	⨁⨁◯◯ LOW	CRITICAL
Pneumonia												
4	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	1/159 (0.6%)	7/125 (5.6%)	**RR 0.14** (0.02 to 1.11)	**48 fewer per 1,000** (from 55 fewer to 6 more)	⨁⨁◯◯ LOW	CRITICAL
OHAT and Oral Index												
4	randomised trials	not serious	serious [c]	not serious	serious [a]	publication bias strongly suspected [b]	125	92	-	SMD **1.13 SD lower** (2.41 lower to 0.14 higher)	⨁◯◯◯ VERY LOW	IMPORTANT
FOIS												
1	randomised trials	not serious	not serious	not serious	not serious	publication bias strongly suspected [b]	25	18	-	MD **2.3 higher** (1.7 higher to 2.9 higher)	⨁⨁⨁◯ MODERATE	IMPORTANT
Length of stay in hospital												
2	observational studies	not serious	not serious	not serious	not serious	publication bias strongly suspected [b]	109	91	-	MD **3.21 lower** (5.26 lower to 1.16 lower)	⨁◯◯◯ VERY LOW	IMPORTANT
Nasogastric tube												
1	randomised trials	not serious	not serious	not serious	not serious	publication bias strongly suspected [b]	12/29 (41.4%)	22/22 (100.0%)	**RR 0.43** (0.28 to 0.65)	**570 fewer per 1,000** (from 720 fewer to 350 fewer)	⨁⨁⨁◯ MODERATE	NOT IMPORTANT

CI: Confidence interval; **RR:** Risk ratio; **SMD:** Standardised mean difference; **MD:** Mean difference

Explanations

a. Wide confidence intervals
b. ≤ 4 studies to report this outcome
c. I2 = 94%

Summary of findings:

Oral health compared to Control in Dysphagia after stroke

Patient or population: Dysphagia after stroke
Setting:
Intervention: Oral health
Comparison: Control

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with Control	Risk with Oral health				
Mortality	140 per 1,000	**87 per 1,000** (39 to 193)	**RR 0.62** (0.28 to 1.38)	203 (1 RCT)	⨁⨁◯◯ LOW [a,b]	
Pneumonia	56 per 1,000	**8 per 1,000** (1 to 62)	**RR 0.14** (0.02 to 1.11)	284 (4 RCTs)	⨁⨁◯◯ LOW [a,b]	
OHAT and Oral Index	-	SMD **1.13 SD lower** (2.41 lower to 0.14 higher)	-	217 (4 RCTs)	⨁◯◯◯ VERY LOW [a,b,c]	
FOIS	The mean FOIS was **0**	MD **2.3 higher** (1.7 higher to 2.9 higher)	-	43 (1 RCT)	⨁⨁⨁◯ MODERATE [b]	
Length of stay in hospital	The mean length of stay in hospital was **0**	MD **3.21 lower** (5.26 lower to 1.16 lower)	-	200 (2 observational studies)	⨁◯◯◯ VERY LOW [b]	
Nasogastric tube	1,000 per 1,000	**430 per 1,000** (280 to 650)	**RR 0.43** (0.28 to 0.65)	51 (1 RCT)	⨁⨁⨁◯ MODERATE [b]	

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

CI: Confidence interval; **RR:** Risk ratio; **SMD:** Standardised mean difference; **MD:** Mean difference

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

Explanations

a. Wide confidence intervals
b. ≤ 4 studies to report this outcome
c. I2 = 94%

4.5 Pharmacological Interventions

Author(s):
Question: Pharmacology compared to Control for Dysphagia after stroke
Setting:
Bibliography:

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Pharmacology	Control	Relative (95% CI)	Absolute (95% CI)		
Mortality												
13	randomised trials	not serious	serious [a]	not serious	serious [b]	none	690/5364 (12.9%)	701/5379 (13.0%)	**RR 0.94** (0.76 to 1.16)	**8 fewer per 1,000** (from 31 fewer to 21 more)	⨁⨁◯◯ LOW	CRITICAL
Pneumonia												
11	randomised trials	not serious	serious [c]	not serious	not serious	none	365/5334 (6.8%)	443/5336 (8.3%)	**RR 0.83** (0.73 to 0.94)	**14 fewer per 1,000** (from 22 fewer to 5 fewer)	⨁⨁⨁◯ MODERATE	CRITICAL
mRS 4-6												
3	randomised trials	not serious	not serious	not serious	serious [b]	publication bias strongly suspected [d]	409/1410 (29.0%)	429/1415 (30.3%)	**RR 0.93** (0.85 to 1.03)	**21 fewer per 1,000** (from 45 fewer to 9 more)	⨁⨁◯◯ LOW	CRITICAL
Swallowing												
1	randomised trials	not serious	not serious	not serious	not serious	publication bias strongly suspected [d]	20/30 (66.7%)	11/30 (36.7%)	**RR 1.82** (1.07 to 3.10)	**301 more per 1,000** (from 26 more to 770 more)	⨁⨁⨁◯ MODERATE	IMPORTANT
Length of stay												
4	randomised trials	not serious	serious [c]	not serious	serious [e]	publication bias strongly suspected [d]			-	MD **0.82 lower** (6.84 lower to 5.21 higher)	⨁◯◯◯ VERY LOW	IMPORTANT
Quality of life, usual activities												
1	randomised trials	not serious	not serious	not serious	serious [b]	publication bias strongly suspected [d]	349/409 (85.3%)	364/424 (85.8%)	**RR 0.99** (0.94 to 1.05)	**9 fewer per 1,000** (from 52 fewer to 43 more)	⨁⨁◯◯ LOW	IMPORTANT

CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference

Explanations

a. I2 = 55%
b. Wide confidence internals
c. I2 ≥ 65%
d. ≤ 7 studies to report this outcome
e. Wide confidence intervals

Summary of findings:

Pharmacology compared to Control for Dysphagia after stroke

Patient or population: Dysphagia after stroke
Setting:
Intervention: Pharmacology
Comparison: Control

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with Control	Risk with Pharmacology				
Mortality	130 per 1,000	**123 per 1,000** (99 to 151)	**RR 0.94** (0.76 to 1.16)	10743 (13 RCTs)	⨁⨁◯◯ LOW [a,b]	
Pneumonia	83 per 1,000	**69 per 1,000** (61 to 78)	**RR 0.83** (0.73 to 0.94)	10670 (11 RCTs)	⨁⨁⨁◯ MODERATE [c]	
mRS 4-6	303 per 1,000	**282 per 1,000** (258 to 312)	**RR 0.93** (0.85 to 1.03)	2825 (3 RCTs)	⨁⨁◯◯ LOW [b,d]	
Swallowing	367 per 1,000	**667 per 1,000** (392 to 1,000)	**RR 1.82** (1.07 to 3.10)	60 (1 RCT)	⨁⨁⨁◯ MODERATE [d]	
Length of stay	The mean length of stay was **0**	MD **0.82 lower** (6.84 lower to 5.21 higher)	-	(4 RCTs)	⨁◯◯◯ VERY LOW [c,d,e]	
Quality of life, usual activities	858 per 1,000	**850 per 1,000** (807 to 901)	**RR 0.99** (0.94 to 1.05)	833 (1 RCT)	⨁⨁◯◯ LOW [b,d]	

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

CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference

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

Explanations

a. I2 = 55%
b. Wide confidence internals
c. I2 ≥ 65%
d. ≤ 7 studies to report this outcome
e. Wide confidence intervals

4.6 Neurostimulation Interventions

Author(s):
Question: Neurostimulation compared to Control in Dysphagia after stroke
Setting:
Bibliography:

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Neurostimulation	Control	Relative (95% CI)	Absolute (95% CI)		
Mortality, PES - 3 months												
4	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	19/139 (13.7%)	13/120 (10.8%)	**RR 1.17** (0.60 to 2.29)	**18 more per 1,000** (from 43 fewer to 140 more)	⨁⨁◯◯ LOW	CRITICAL
mRS												
4	randomised trials	not serious	serious [c]	not serious	not serious	publication bias strongly suspected [b]	122	93	-	MD **0.68 lower** (1.22 lower to 0.13 lower)	⨁⨁◯◯ LOW	CRITICAL
Pneumonia												
5	randomised trials	not serious	not serious	not serious	serious [a]	publication bias strongly suspected [b]	22/186 (11.8%)	32/181 (17.7%)	**RR 0.70** (0.45 to 1.09)	**53 fewer per 1,000** (from 97 fewer to 16 more)	⨁⨁◯◯ LOW	CRITICAL
OVERALL, Dysphagia, Improvement												
44	randomised trials	not serious	serious [d]	not serious	not serious	none	820	621	-	SMD **88 SD higher** (0.64 higher to 1.12 higher)	⨁⨁⨁◯ MODERATE	CRITICAL
LOS												
4	randomised trials	not serious	not serious	not serious	serious [e]	publication bias strongly suspected [b]	137	114	-	MD **1.19 lower** (7.35 lower to 4.97 higher)	⨁⨁◯◯ LOW	IMPORTANT
QoL, Anxiety, Depression - Swallowing QoL, Change												
3	randomised trials	not serious	not serious	not serious	not serious	publication bias strongly suspected [b]	67	39	-	MD **18.02 higher** (11.41 higher to 24.63 higher)	⨁⨁⨁◯ MODERATE	IMPORTANT

CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference; **SMD:** Standardised mean difference

Explanations

a. Few events and wide confidence intervals
b. Seven or less studies to support this outcome
c. I2 = 62%
d. I2 = ≥75%
e. Wide confidence intervals

Summary of findings:

Neurostimulation compared to Control in Dysphagia after stroke

Patient or population: Dysphagia after stroke
Setting:
Intervention: Neurostimulation
Comparison: Control

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with Control	Risk with Neurostimulation				
Mortality, PES - 3 months	108 per 1,000	**127 per 1,000** (65 to 248)	**RR 1.17** (0.60 to 2.29)	259 (4 RCTs)	⨁⨁◯◯ LOW [a,b]	
mRS	The mean mRS was **0**	MD **0.68 lower** (1.22 lower to 0.13 lower)	-	215 (4 RCTs)	⨁⨁◯◯ LOW [b,c]	
Pneumonia	177 per 1,000	**124 per 1,000** (80 to 193)	**RR 0.70** (0.45 to 1.09)	367 (5 RCTs)	⨁⨁◯◯ LOW [a,b]	
OVERALL, Dysphagia, Improvement	-	SMD **88 SD higher** (0.64 higher to 1.12 higher)	-	1441 (44 RCTs)	⨁⨁⨁◯ MODERATE [d]	
LOS	The mean LOS was **0**	MD **1.19 lower** (7.35 lower to 4.97 higher)	-	251 (4 RCTs)	⨁⨁◯◯ LOW [b,e]	
QoL, Anxiety, Depression - Swallowing QoL, Change	The mean qoL, Anxiety, Depression - Swallowing QoL, Change was **0**	MD **18.02 higher** (11.41 higher to 24.63 higher)	-	106 (3 RCTs)	⨁⨁⨁◯ MODERATE [b]	

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

CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference; **SMD:** Standardised mean difference

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

Explanations

a. Few events and wide confidence intervals
b. Seven or less studies to support this outcome
c. I2 = 62%
d. I2 = ≥75%
e. Wide confidence intervals