EUROPEAN STROKE ORGANISATION

THE EUROPEAN ASSOCIATION OF NEUROSURGICAL SOCIETIES

European Stroke Organisation (ESO) and European Association of Neurosurgical Societies (EANS) Guideline on intracerebral haemorrhage

Moderators: Thorsten Steiner, Rustam Al-Shahi-Salman, Andreas Raabe

21.01.2026, 17:00 - 18:30 CET

Disclosures

Thorsten Steiner, Jan C Purrucker, Diana Aguiar de Sousa, Trine Apostolaki-Hansson, Jürgen Beck, Hanne Christensen, Charlotte Cordonnier, Matthew B Downer, Helle Eilertsen, Rachael Gartly, Stefan T Gerner, Leonard Ho, Silje Holt Jahr, Catharina JM Klijn, Nicolas Martinez-Majander, Kateriine Orav, Jesper Petersson, Andreas Raabe, Else Charlotte Sandset, Floris H Schreuder, David Seiffge, and Rustam Al-Shahi Salman

Please refer to: supplement of the publication.

Presented and published online: 22.05.2025
Published in print: Eur Stroke J. 2025;10:1007–1086

ESO
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ESO-EANS guideline on intracerebral haemorrhage

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Diana Aguiar de Sousa
Portugal

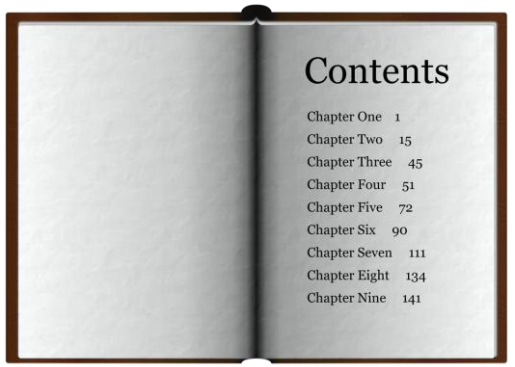
01
General management

52 years, male, right-handed

Symptoms
- Acute left hemiparesis

PMH
- Arterial hypertension
- Atrial fibrillation (Rivaroxaban 20 mg/day)
- Ischemic heart disease

01 General management



1. General management

1.1 Management on specialised units

1.2 Radiological investigation for underlying cause

1.2.1 Imaging Scores of acute ICH

1.2.2 Type of imaging for acute ICH

1.3 Outcome prediction

1.3.1 Outcome scores

1.3.2 **Withdrawal of treatment**

PICO 1.1.1 In adults with spontaneous ICH, does admission to an **organised stroke unit** versus admission to a **general ward** reduce the risk of death or death/dependence?

Evidence-based Recommendation

In adults with spontaneous ICH, not requiring intensive care treatment, we recommend admission to an organised stroke unit to reduce the risk of death or dependence.

Quality of evidence: Moderate ⊕⊕⊕

Strength of recommendation: Strong for intervention ↑↑

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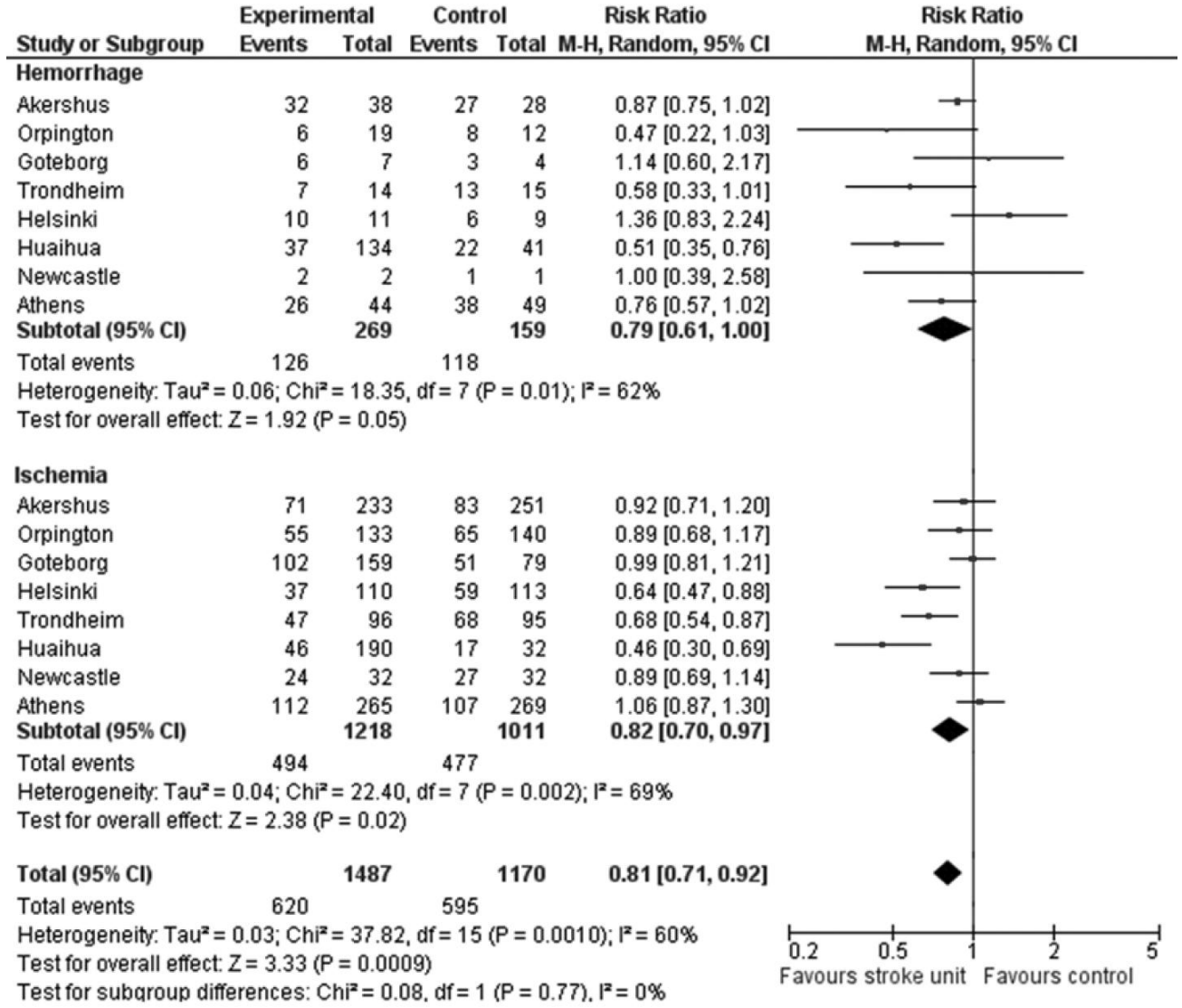
PICO 1.1.1
Management on specialised units



Study or Subgroup	Experimental Events	Total	Control Events	Total	Risk Ratio M-H, Random, 95% CI
Hemorrhage					
Akershus	32	38	27	28	0.87 [0.75, 1.02]
Orpington	6	19	8	12	0.47 [0.22, 1.03]
Goteborg	6	7	3	4	1.14 [0.60, 2.17]
Trondheim	7	14	13	15	0.58 [0.33, 1.01]
Helsinki	10	11	6	9	1.36 [0.83, 2.24]
Huaihua	37	134	22	41	0.51 [0.35, 0.76]
Newcastle	2	2	1	1	1.00 [0.39, 2.58]
Athens	26	44	38	49	0.76 [0.57, 1.02]
Subtotal (95% CI)		**269**		**159**	**0.79 [0.61, 1.00]**
Total events	126		118		
Heterogeneity: Tau² = 0.06; Chi² = 18.35, df = 7 (P = 0.01); I² = 62%					
Test for overall effect: Z = 1.92 (P = 0.05)					
Ischemia					
Akershus	71	233	83	251	0.92 [0.71, 1.20]
Orpington	55	133	65	140	0.89 [0.68, 1.17]
Goteborg	102	159	51	79	0.99 [0.81, 1.21]
Helsinki	37	110	59	113	0.64 [0.47, 0.88]
Trondheim	47	96	68	95	0.68 [0.54, 0.87]
Huaihua	46	190	17	32	0.46 [0.30, 0.69]
Newcastle	24	32	27	32	0.89 [0.69, 1.14]
Athens	112	265	107	269	1.06 [0.87, 1.30]
Subtotal (95% CI)		**1218**		**1011**	**0.82 [0.70, 0.97]**
Total events	494		477		
Heterogeneity: Tau² = 0.04; Chi² = 22.40, df = 7 (P = 0.002); I² = 69%					
Test for overall effect: Z = 2.38 (P = 0.02)					
Total (95% CI)		**1487**		**1170**	**0.81 [0.71, 0.92]**
Total events	620		595		
Heterogeneity: Tau² = 0.03; Chi² = 37.82, df = 15 (P = 0.0010); I² = 60%					
Test for overall effect: Z = 3.33 (P = 0.0009)					
Test for subgroup differences: Chi² = 0.08, df = 1 (P = 0.77), I² = 0%					

Stroke unit vs conventional care: **death or dependency** at the end of scheduled follow-up

Relative risk of 0.79; 95% CI 0.61–1.00

Langhorne, P et al. Stroke, 2013; 44 (11): 3044–9

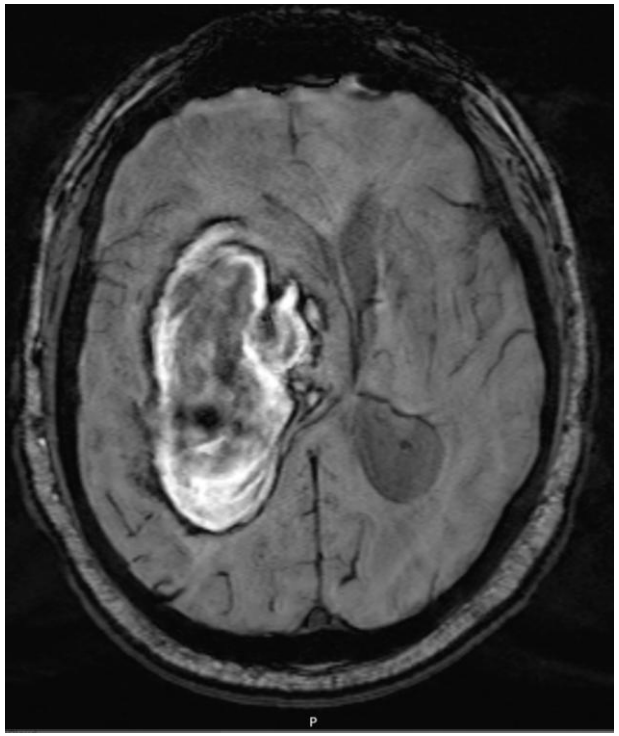
52 years, male, right-handed

Stroke units provide comprehensive, structured care

Complications during **SU admission (3 weeks)**:

- Hypertension
- Hematoma expansion
- Neurological deterioration
- Hyponatremia
- Hydrocephalus
- Delirium
- Ischemic stroke

- mRS 3 at 6 months



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Radiological investigation for underlying cause

Evidence-based Recommendation

In adults with spontaneous ICH, we suggest using algorithms such as DIAGRAM for targeted investigation of ICH cause versus standard care to improve the performance (calibration/ discrimination/clinical utility) of prediction of underlying cause of ICH.

Quality of evidence: Low ⊕⊕

Strength of recommendation: Weak for intervention ↑?

Expert consensus statement

In adults with spontaneous ICH, we suggest using cerebral computed tomographic angiography (CTA)/venography (CTV), or magnetic resonance angiography (MRA)/venography (MRV) to select patients for intra-arterial digital subtraction angiography (IADSA) to disclose underlying intracranial vascular malformations.

Vote: 15/15

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Withdrawal of treatment

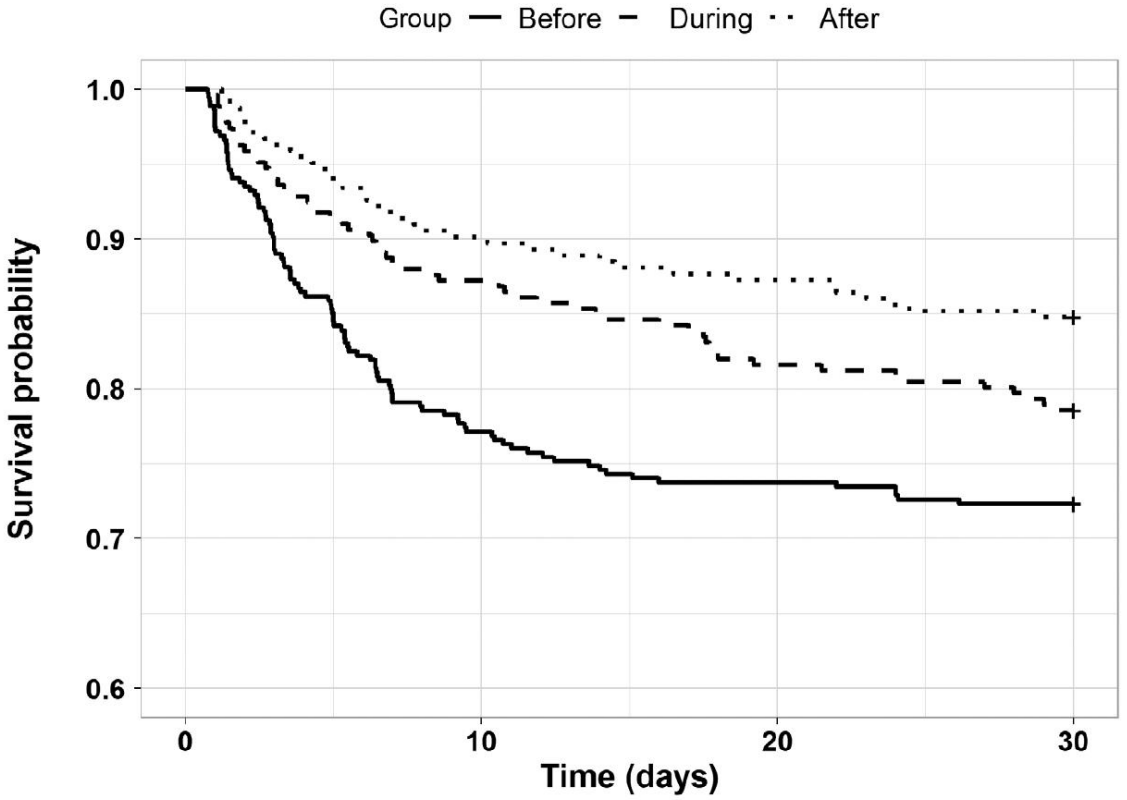
PICO 1.3.2 For adults with ICH, does a policy for **limitation of treatment, do not attempt cardiopulmonary resuscitation (DNR), or early initiation of palliative care orders** within the first **24 h** compared with standard of care influence the risk of **death or dependence**?

Expert consensus statement

In adults within 24 h of spontaneous ICH onset, we suggest not implementing general policies that limit treatment or initiate do not attempt cardiopulmonary resuscitation orders.

Vote: 15/15

Reduction in **early DNR orders** **mediated 53%** of the association between bundle implementation and the **reduced 30-day case fatality**

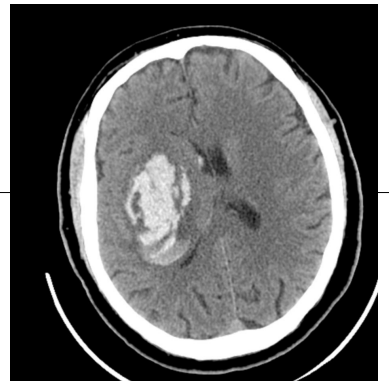


Measure	Before implementation, n = 353	During Implementation, n = 266	After Implementation, n = 241	*p*
DNR <24 hours, n (%)	96 (27.2)	47 (17.7)	38 (15.8)	<0.001

Parry-Jones AR et al. Ann Neurol. 2019

ESO-EANS ICH guideline

General management	↑↑	Treatment on **organised stroke units**
	↓?	Limiting treatment within 24h of ICH onset



Avoid early nihilism,

provide comprehensive acute care in the first 24 hours,

Investigate for an underlying cause with appropriate Imaging

allow time for accurate prognostication before making treatment limitation decisions

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PICO 2 Blood pressure

Trine Apostolakis-Hansson
Sweden

PICO 2: In adults with acute spontaneous ICH, does **altering blood pressure (BP) to a lower target** compared with either no use of BP alteration to a specific target or using targets different from the lower range, result in **reduced death or dependence, death, or haematoma expansion (HE)**?

PICO 2: In adults with acute spontaneous ICH, does altering blood pressure (BP) to a lower target compared with either no use of BP alteration to a specific target or using targets different from the lower range, result in reduced death or dependence, death, or haematoma expansion (HE)?

Evidence-based Recommendation

For adults with acute spontaneous ICH and systolic blood pressure of 150 to 220 mmHg, the overall balance of beneficial and adverse effects is uncertain, so we recommend recruitment to ongoing randomised controlled trials.

Quality of evidence: Low ⨁⨁

Strength of recommendation: --

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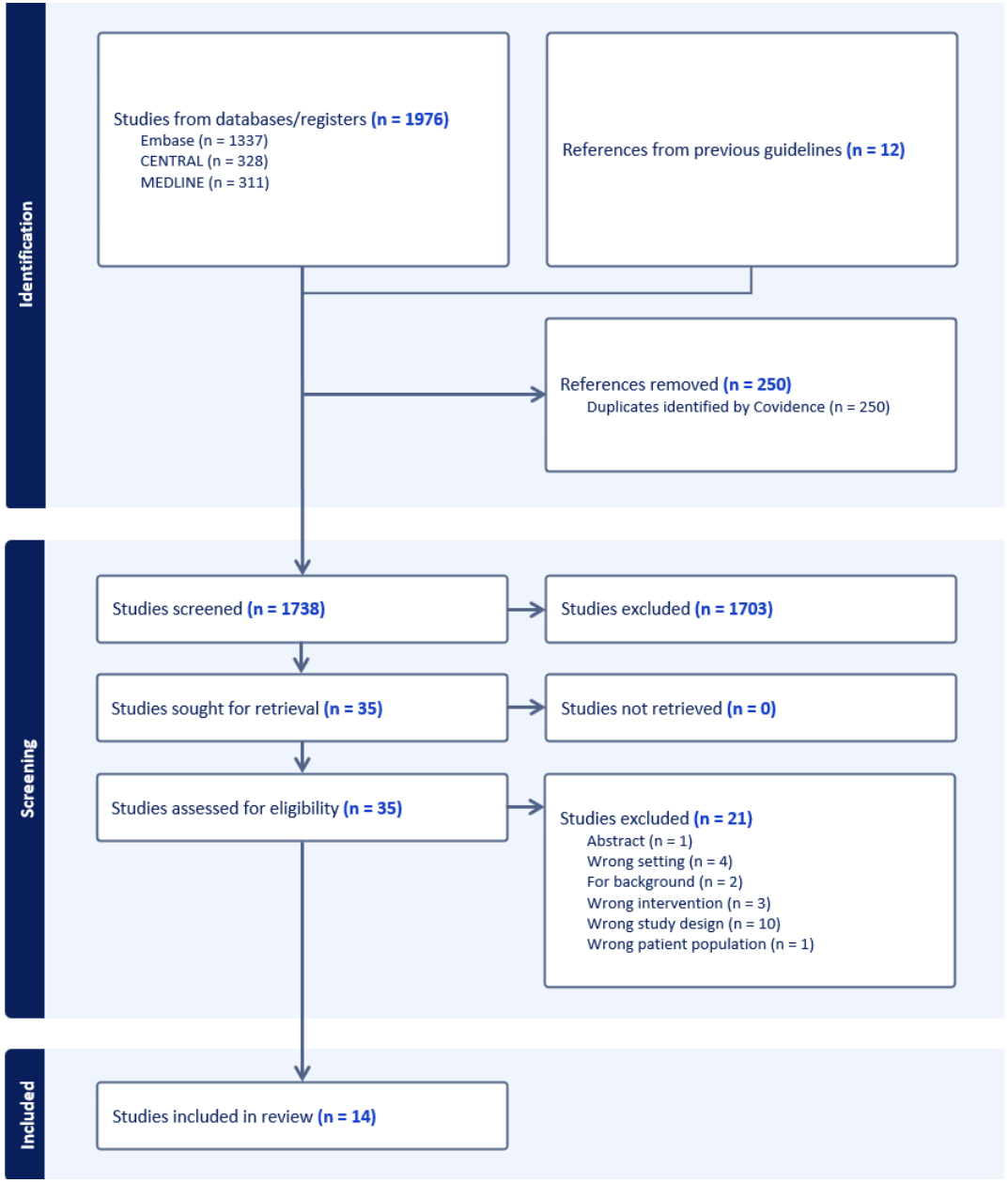
PICO 2: In adults with acute spontaneous ICH, does altering blood pressure (BP) to a lower target compared with either no use of BP alteration to a specific target or using targets different from the lower range, result in reduced death or dependence, death, or haematoma expansion (HE)?

Expert consensus statements

- We suggest lowering systolic blood pressure **below 140 mmHg within 6 hours** of symptom onset in minor or moderate ICH (haematoma volume < 30 mL) to reduce haematoma expansion.
- For adults with spontaneous ICH, we suggest **avoiding** a reduction in systolic blood pressure of **more than 70 mmHg** from baseline and to avoid active reduction of systolic blood pressure below **110 mmHg**.
- **Caution** is advised when lowering very high systolic blood pressure (**>220 mmHg**), for patients with large haematoma volumes (**>30 mL**) or when there is planned haematoma evacuation.
- For adults with spontaneous **minor or moderate ICH** (haematoma volume < 30 mL), we suggest applying the following aspects:
  - Initiating antihypertensive treatment as early as possible, ideally within the first two hours following the onset of symptoms (**acute phase**):
    - Lower systolic blood pressure to **<140 mmHg** and **minimise variability** in blood pressure fluctuations.
  - After lowering systolic blood pressure below the target threshold (**up to 7 days**, sub-acute phase):
    - Maintain systolic blood pressure below 140 mmHg.

Vote: 15/15

Literature search for PICO 2



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PICO 2: In adults with acute spontaneous ICH, does **altering blood pressure (BP)** to a lower target compared with either no use of BP alteration to a specific target or using targets different from the lower range, result in reduced death or dependence, death, or haematoma expansion (HE)?

GRADE evidence profile

Certainty assessment							Summary of findings					
							№ of patients		Effect			
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	rFVIIa	Placebo/Open control	Relative (95% CI)	Absolute (95% CI)	Certainty	Importance
Death or dependence (mRS 4–6) at day 90												
7	Randomised trials	Very serious [a]	Serious[b]	Not serious	Not serious	None	494/1003 (49.3%)	238/451 (52.8%)	OR 0.71 (0.46 to 1.11)	85 fewer per 1,000 (from 188 fewer to 26 more)	⨁◯◯◯ Very low	Critical
Death from any cause by day 90												
9	Randomised trials	Very serious [a]	Serious[b]	Not serious	Not serious	None	194/1048 (18.5%)	106/496 (21.4%)	OR 0.69 (0.43 to 1.11)	56 fewer per 1,000 (from 109 fewer to 18 more)	⨁◯◯◯ Very low	Critical
Haemorrhage expansion by 24 hours												
5	Randomised trials	Very serious [a]	Not serious	Not serious	Serious[c]	None	48/132 (36.4%)	35/88 (39.8%)	OR 0.65 (0.27 to 1.56)	97 more per 1,000 (from 246 fewer to 110 more)	⨁◯◯◯ Very low	Important
Thromboembolic adverse events												
7	Randomised trials	Very serious [a]	Not serious	Not serious	Serious[c]	None	83/1007 (8.2%)	31/460 (6.7%)	OR 1.20 (0.76 to 1.89)	12 more per 1,000 (from 15 fewer to 53 more) [b]	⨁◯◯◯ Very low	Important

a Downgraded two levels due to high risk of bias
b Downgraded one level due to high heterogeneity
c Downgraded one level due to limited number of events

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PICO 2: In adults with acute spontaneous ICH, does **altering blood pressure (BP)** to a lower target compared with either no use of BP alteration to a specific target or using targets different from the lower range, result in reduced death or dependence, death, or haematoma expansion (HE)?

Good functional outcome (mRS 0–2)

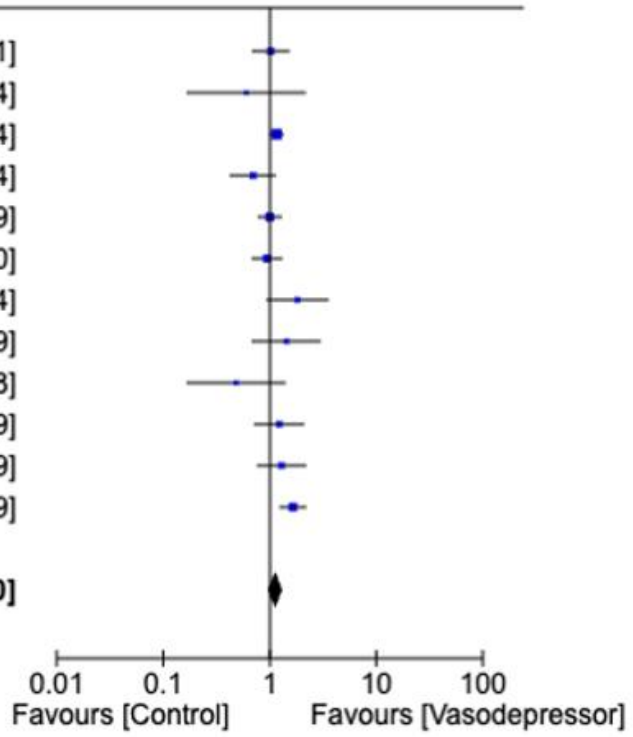
at 3 to 6 months

Study or Subgroup	Vasodepressor Events	Total	Control Events	Total	Weight	Odds ratio M-H, Random, 95% CI
INTERACT 2008	108	203	106	201	9.5%	1.02 [0.69 , 1.51]
Koch 2008	8	20	10	19	1.4%	0.60 [0.17 , 2.14]
INTERACT-2 2013	663	1382	627	1412	19.7%	1.15 [0.99 , 1.34]
SCAST 2014	83	144	86	130	7.1%	0.70 [0.43 , 1.14]
ATACH-2 2016	211	481	211	480	14.6%	1.00 [0.77 , 1.29]
ENOS 2016	105	309	112	316	11.6%	0.94 [0.67 , 1.30]
PATICH 2017	29	96	19	99	4.5%	1.82 [0.94 , 3.54]
Gupta 2018	26	59	21	59	3.7%	1.43 [0.68 , 2.99]
RIGHT-2 2019	6	74	11	71	2.0%	0.48 [0.17 , 1.38]
CHASE 2020	46	126	37	116	6.3%	1.23 [0.72 , 2.09]
Dong 2024	57	112	49	110	6.4%	1.29 [0.76 , 2.19]
INTERACT-4 2024	156	515	106	507	13.3%	1.64 [1.24 , 2.19]
Total (Wald[a])		**3521**		**3520**	**100.0%**	**1.12 [0.96 , 1.30]**
Total events:	1498		1395			

Test for overall effect: Z = 1.39 (P = 0.17)

Test for subgroup differences: Not applicable

Heterogeneity: Tau² (DL[b]) = 0.03; Chi² = 19.09, df = 11 (P = 0.06); I² = 42%



Footnotes

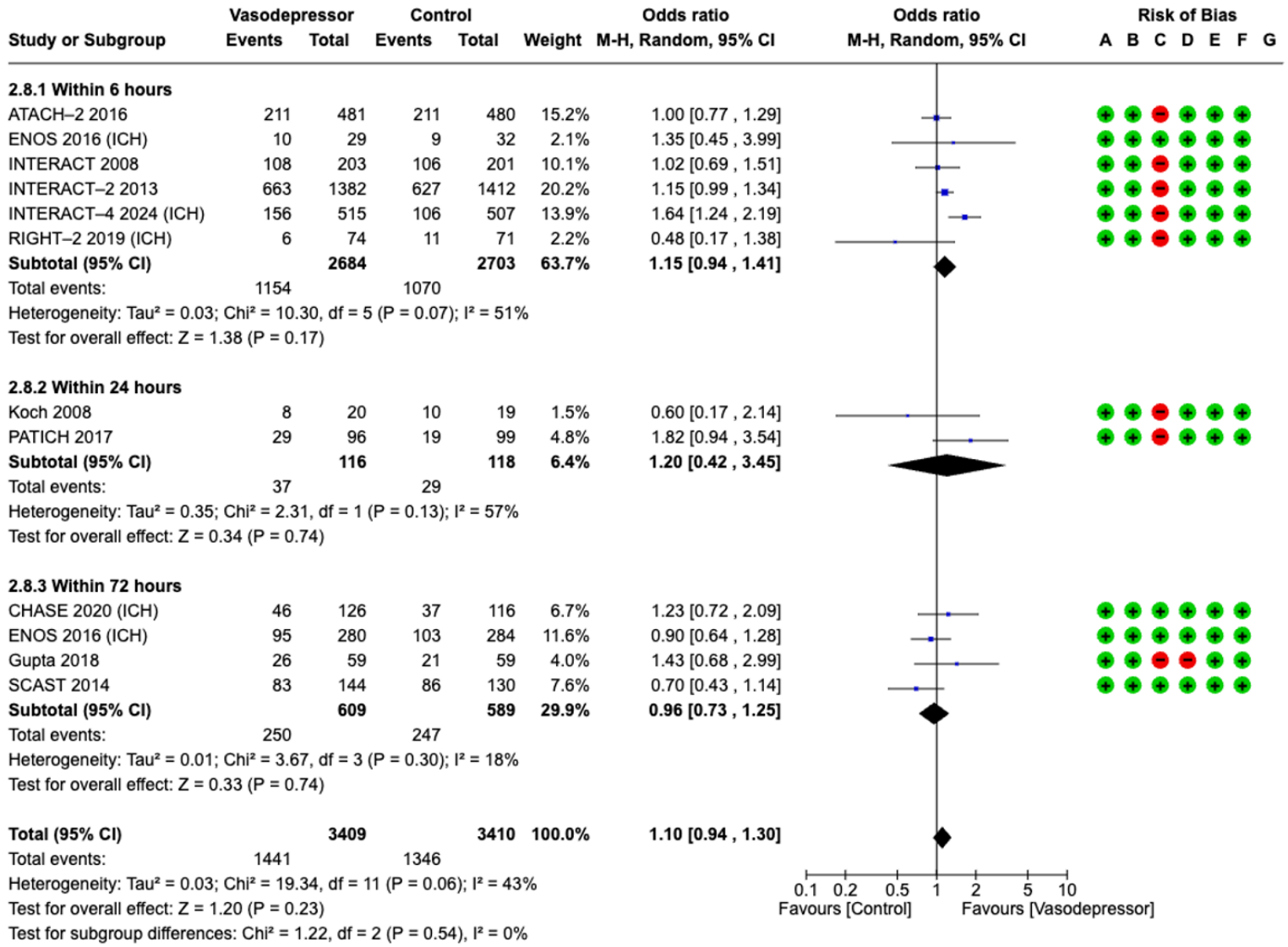
[a]CI calculated by Wald-type method.

[b]Tau² calculated by DerSimonian and Laird method.

*Update 2026

PICO 2: In adults with acute spontaneous ICH, does **altering blood pressure (BP)** to a lower target compared with either no use of BP alteration to a specific target or using targets different from the lower range, result in reduced death or dependence, death, or haematoma expansion (HE)?

Good functional outcome (mRS 0–2) at 3 to 6 months stratified by **enrollment time** to treatment



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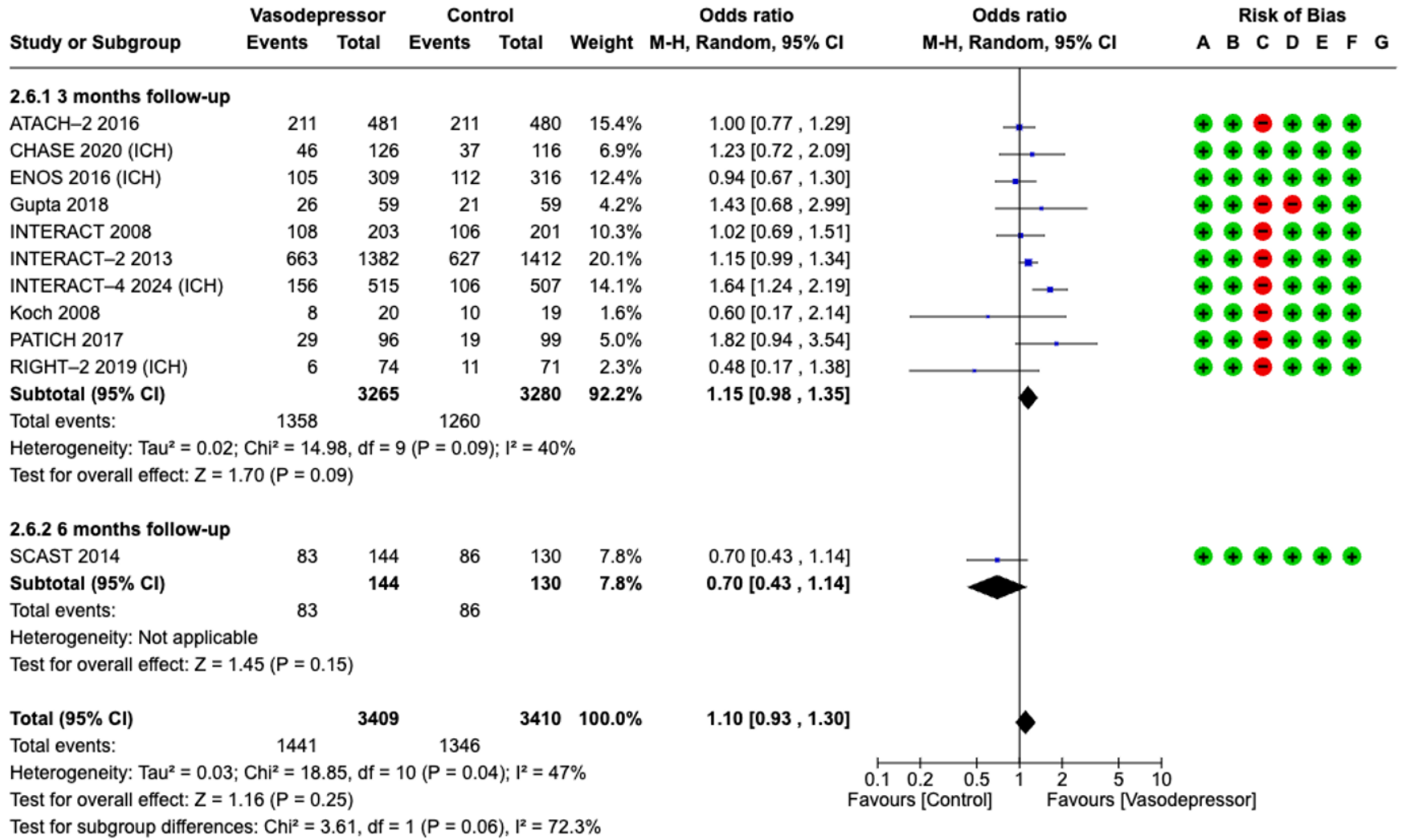
PICO 2: In adults with acute spontaneous ICH, does **altering blood pressure (BP)** to a lower target compared with either no use of BP alteration to a specific target or using targets different from the lower range, result in reduced death or dependence, death, or haematoma expansion (HE)?

Good functional outcome (mRS 0–2) at 3 to 6 months

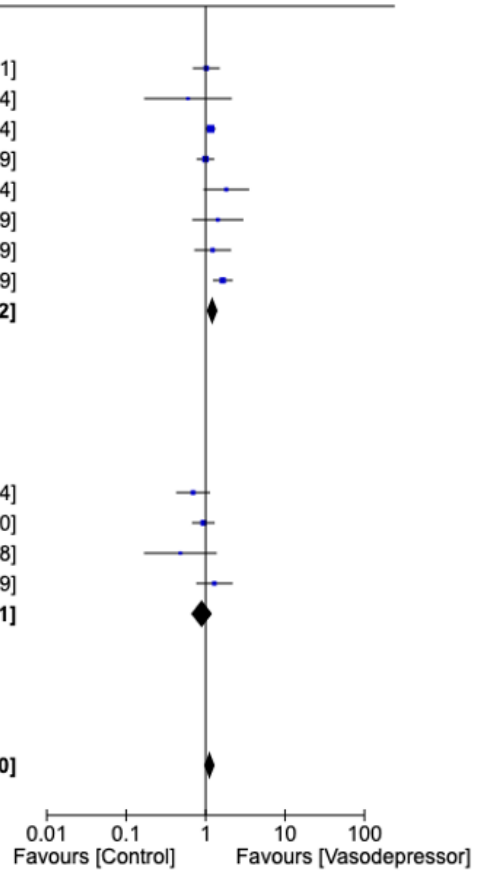


Study or Subgroup	Vasodepressor Events	Total	Control Events	Total	Weight	Odds ratio M-H, Random, 95% CI
2.6.1 3 months follow-up						
ATACH–2 2016	211	481	211	480	15.4%	1.00 [0.77 , 1.29]
CHASE 2020 (ICH)	46	126	37	116	6.9%	1.23 [0.72 , 2.09]
ENOS 2016 (ICH)	105	309	112	316	12.4%	0.94 [0.67 , 1.30]
Gupta 2018	26	59	21	59	4.2%	1.43 [0.68 , 2.99]
INTERACT 2008	108	203	106	201	10.3%	1.02 [0.69 , 1.51]
INTERACT–2 2013	663	1382	627	1412	20.1%	1.15 [0.99 , 1.34]
INTERACT–4 2024 (ICH)	156	515	106	507	14.1%	1.64 [1.24 , 2.19]
Koch 2008	8	20	10	19	1.6%	0.60 [0.17 , 2.14]
PATICH 2017	29	96	19	99	5.0%	1.82 [0.94 , 3.54]
RIGHT–2 2019 (ICH)	6	74	11	71	2.3%	0.48 [0.17 , 1.38]
Subtotal (95% CI)		**3265**		**3280**	**92.2%**	**1.15 [0.98 , 1.35]**
Total events:	1358		1260			
Heterogeneity: Tau² = 0.02; Chi² = 14.98, df = 9 (P = 0.09); I² = 40%						
Test for overall effect: Z = 1.70 (P = 0.09)						
2.6.2 6 months follow-up						
SCAST 2014	83	144	86	130	7.8%	0.70 [0.43 , 1.14]
Subtotal (95% CI)		**144**		**130**	**7.8%**	**0.70 [0.43 , 1.14]**
Total events:	83		86			
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.45 (P = 0.15)						
Total (95% CI)		**3409**		**3410**	**100.0%**	**1.10 [0.93 , 1.30]**
Total events:	1441		1346			
Heterogeneity: Tau² = 0.03; Chi² = 18.85, df = 10 (P = 0.04); I² = 47%						
Test for overall effect: Z = 1.16 (P = 0.25)						
Test for subgroup differences: Chi² = 3.61, df = 1 (P = 0.06), I² = 72.3%						

PICO 2: In adults with acute spontaneous ICH, does **altering blood pressure (BP)** to a lower target compared with either no use of BP alteration to a specific target or using targets different from the lower range, result in reduced death or dependence, death, or haematoma expansion (HE)?

Good functional outcome (mRS 0–2) at 3 to 6 months stratified by intervention type*

Study or Subgroup	Vasodepressor Events	Vasodepressor Total	Control Events	Control Total	Weight	Odds ratio M-H, Random, 95% CI
1.1.1 BP target–based interventions						
INTERACT 2008	108	203	106	201	9.5%	1.02 [0.69 , 1.51]
Koch 2008	8	20	10	19	1.4%	0.60 [0.17 , 2.14]
INTERACT-2 2013	663	1382	627	1412	19.7%	1.15 [0.99 , 1.34]
ATACH-2 2016	211	481	211	480	14.6%	1.00 [0.77 , 1.29]
PATICH 2017	29	96	19	99	4.5%	1.82 [0.94 , 3.54]
Gupta 2018	26	59	21	59	3.7%	1.43 [0.68 , 2.99]
CHASE 2020	46	126	37	116	6.3%	1.23 [0.72 , 2.09]
INTERACT-4 2024	156	515	106	507	13.3%	1.64 [1.24 , 2.19]
Subtotal (Wald[a])		**2882**		**2893**	**73.0%**	**1.21 [1.03 , 1.42]**
Total events:	1247		1137			
Test for overall effect: Z = 2.32 (P = 0.02)						
Heterogeneity: Tau² (DL[b]) = 0.02; Chi² = 10.52, df = 7 (P = 0.16); I² = 33%						
1.1.2 Fixed-antihypertensive agent interventions						
SCAST 2014	83	144	86	130	7.1%	0.70 [0.43 , 1.14]
ENOS 2016	105	309	112	316	11.6%	0.94 [0.67 , 1.30]
RIGHT-2 2019	6	74	11	71	2.0%	0.48 [0.17 , 1.38]
Dong 2024	57	112	49	110	6.4%	1.29 [0.76 , 2.19]
Subtotal (Wald[a])		**639**		**627**	**27.0%**	**0.89 [0.66 , 1.21]**
Total events:	251		258			
Test for overall effect: Z = 0.76 (P = 0.45)						
Heterogeneity: Tau² (DL[b]) = 0.03; Chi² = 4.25, df = 3 (P = 0.24); I² = 29%						
Total (Wald[a])		**3521**		**3520**	**100.0%**	**1.12 [0.96 , 1.30]**
Total events:	1498		1395			
Test for overall effect: Z = 1.39 (P = 0.17)						
Test for subgroup differences: Chi² = 3.06, df = 1 (P = 0.08), I² = 67.3%						
Heterogeneity: Tau² (DL[b]) = 0.03; Chi² = 19.09, df = 11 (P = 0.06); I² = 42%						



Footnotes

[a]CI calculated by Wald-type method.

[b]Tau² calculated by DerSimonian and Laird method.

*Update 2026

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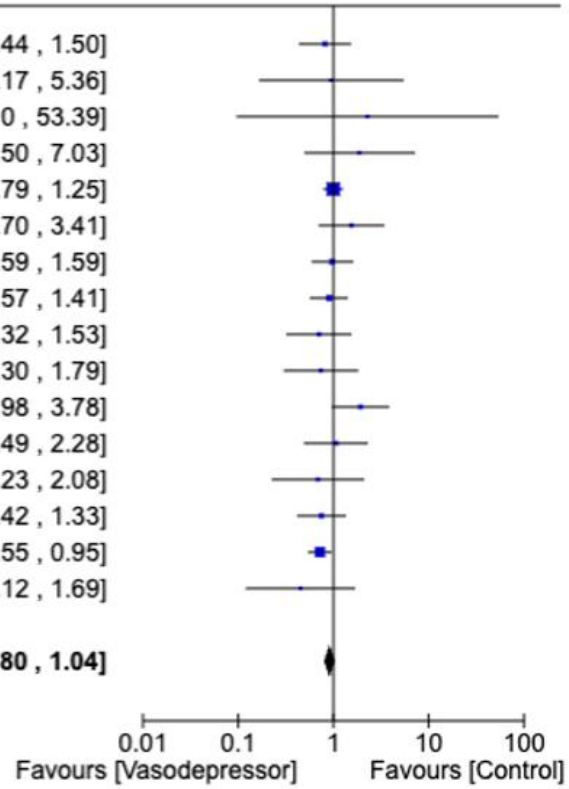
PICO 2: In adults with acute spontaneous ICH, does **altering blood pressure (BP)** to a lower target compared with either no use of BP alteration to a specific target or using targets different from the lower range, result in reduced death or dependence, death, or haematoma expansion (HE)?

Death within 3 to 6 months

Study or Subgroup	Vasodepressor Events	Vasodepressor Total	Control Events	Control Total	Weight	Odds ratio M-H, Random, 95% CI
INTERACT 2008	21	203	25	201	4.6%	0.81 [0.44 , 1.50]
Koch 2008	3	20	3	19	0.6%	0.94 [0.17 , 5.36]
CHHIPS 2009	2	18	0	7	0.2%	2.27 [0.10 , 53.39]
ICH ADAPT 2013	7	37	4	36	1.0%	1.87 [0.50 , 7.03]
INTERACT-2 2013	166	1394	170	1421	33.3%	0.99 [0.79 , 1.25]
SCAST 2014	18	144	11	130	2.8%	1.55 [0.70 , 3.41]
ATACH-2 2016	33	500	34	500	7.0%	0.97 [0.59 , 1.59]
ENOS 2016	42	309	47	316	8.6%	0.90 [0.57 , 1.41]
PATICH 2017	13	96	18	99	2.9%	0.70 [0.32 , 1.53]
Gupta 2018	11	59	14	59	2.2%	0.74 [0.30 , 1.79]
RIGHT-2 2019	35	73	23	71	3.8%	1.92 [0.98 , 3.78]
CHASE 2020	16	126	14	116	2.9%	1.06 [0.49 , 2.28]
MR ASAP 2022	16	35	11	20	1.4%	0.69 [0.23 , 2.08]
Dong 2024	25	137	33	143	5.1%	0.74 [0.42 , 1.33]
INTERACT-4 2024	125	515	156	507	22.7%	0.72 [0.55 , 0.95]
ICH ADAPT-2 2025	4	42	7	37	1.0%	0.45 [0.12 , 1.69]
Total (Wald[a])		**3708**		**3682**	**100.0%**	**0.91 [0.80 , 1.04]**
Total events:	537		570			

Test for overall effect: Z = 1.43 (P = 0.15)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 13.95, df = 15 (P = 0.53); I² = 0%



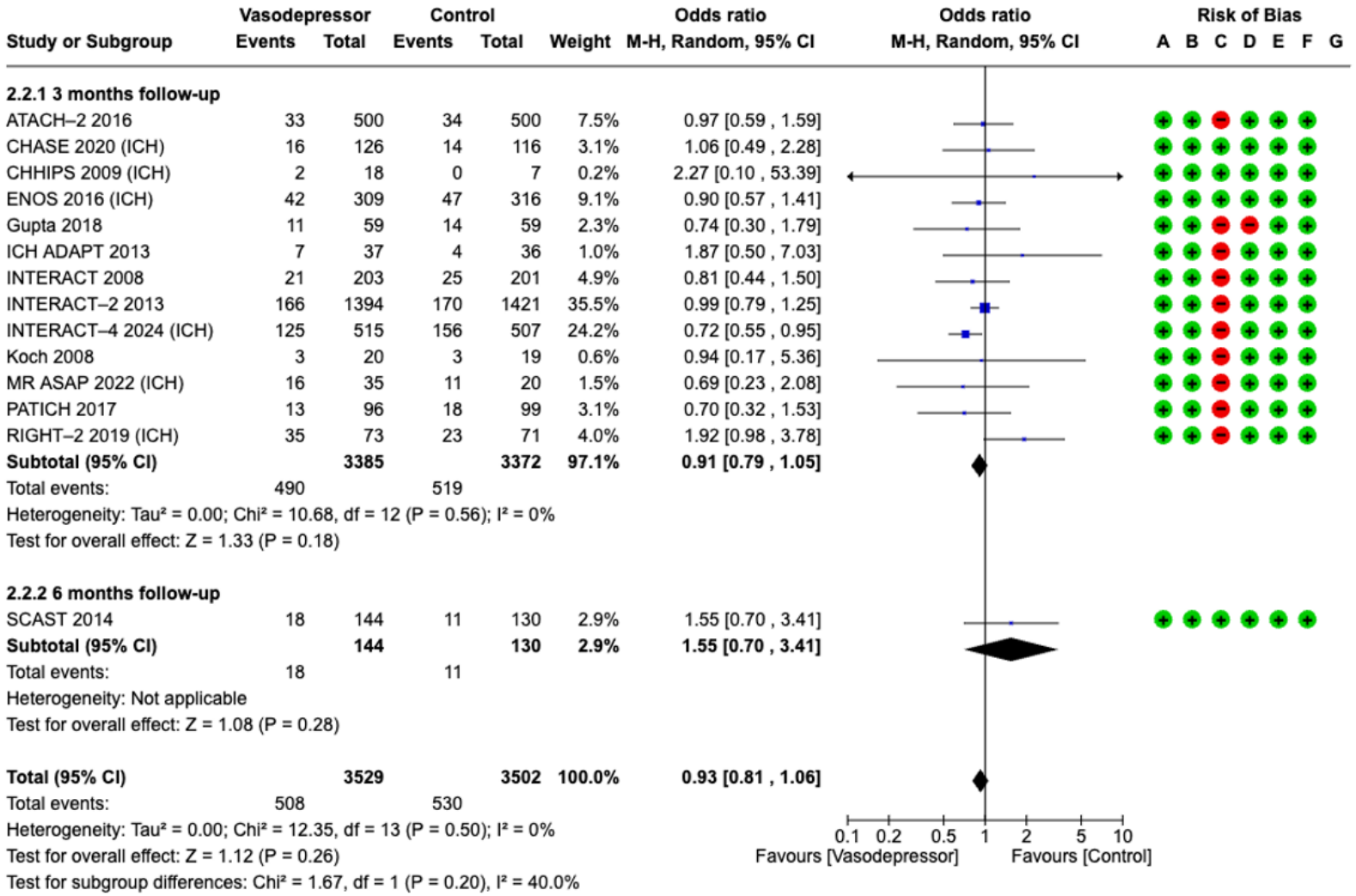
Footnotes
[a]CI calculated by Wald-type method.
[b]Tau² calculated by DerSimonian and Laird method.

*Update 2026

EUROPEAN STROKE ORGANISATION

PICO 2: In adults with acute spontaneous ICH, does **altering blood pressure (BP)** to a lower target compared with either no use of BP alteration to a specific target or using targets different from the lower range, result in reduced death or dependence, death, or haematoma expansion (HE)?

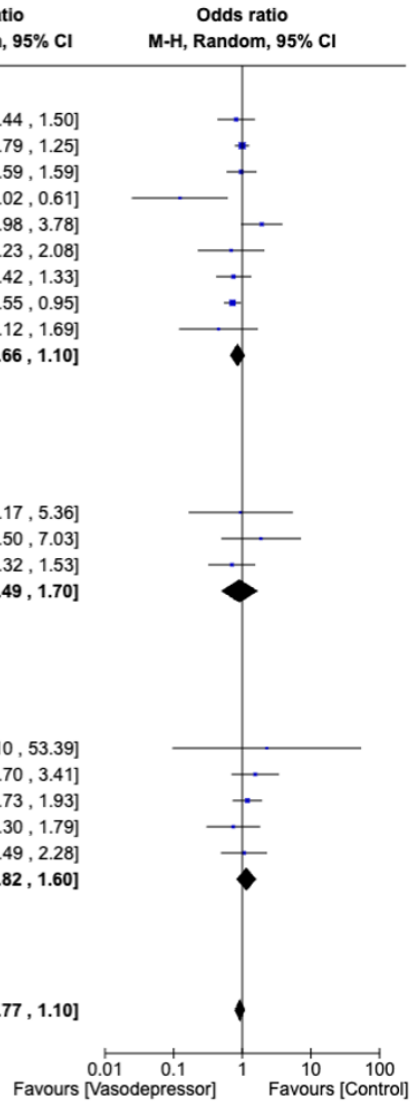
Death within 3 to 6 months



EUROPEAN STROKE ORGANISATION

Death within 3 to 6 months stratified by **enrollment time** to treatment

Study or Subgroup	Vasodepressor Events	Vasodepressor Total	Control Events	Control Total	Weight	Odds ratio M-H, Random, 95% CI
6.4.1 Within 6 hours						
INTERACT 2008	21	203	25	201	6.5%	0.81 [0.44 , 1.50]
INTERACT-2 2013	166	1394	170	1421	19.9%	0.99 [0.79 , 1.25]
ATACH-2 2016	33	500	34	500	9.0%	0.97 [0.59 , 1.59]
ENOS 2016	2	29	12	32	1.2%	0.12 [0.02 , 0.61]
RIGHT-2 2019	35	73	23	71	5.6%	1.92 [0.98 , 3.78]
MR ASAP 2022	16	35	11	20	2.4%	0.69 [0.23 , 2.08]
Dong 2024	25	137	33	143	7.1%	0.74 [0.42 , 1.33]
INTERACT-4 2024	125	515	156	507	17.3%	0.72 [0.55 , 0.95]
ICH ADAPT-2 2025	4	42	7	37	1.7%	0.45 [0.12 , 1.69]
Subtotal (Wald[a])		**2928**		**2932**	**70.8%**	**0.85 [0.66 , 1.10]**
Total events:	427		471			
Test for overall effect: Z = 1.24 (P = 0.22)						
Heterogeneity: Tau² (DL[b]) = 0.06; Chi² = 15.69, df = 8 (P = 0.05); I² = 49%						
6.4.2 Within 24 hours						
Koch 2008	3	20	3	19	1.0%	0.94 [0.17 , 5.36]
ICH ADAPT 2013	7	37	4	36	1.7%	1.87 [0.50 , 7.03]
PATICH 2017	13	96	18	99	4.5%	0.70 [0.32 , 1.53]
Subtotal (Wald[a])		**153**		**154**	**7.2%**	**0.91 [0.49 , 1.70]**
Total events:	23		25			
Test for overall effect: Z = 0.30 (P = 0.76)						
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 1.55, df = 2 (P = 0.46); I² = 0%						
6.4.3 Within 72 hours						
CHHIPS 2009	2	18	0	7	0.3%	2.27 [0.10 , 53.39]
SCAST 2014	18	144	11	130	4.3%	1.55 [0.70 , 3.41]
ENOS 2016	40	280	35	284	9.2%	1.19 [0.73 , 1.93]
Gupta 2018	11	59	14	59	3.5%	0.74 [0.30 , 1.79]
CHASE 2020	16	126	14	116	4.6%	1.06 [0.49 , 2.28]
Subtotal (Wald[a])		**627**		**596**	**22.0%**	**1.15 [0.82 , 1.60]**
Total events:	87		74			
Test for overall effect: Z = 0.79 (P = 0.43)						
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 1.74, df = 4 (P = 0.78); I² = 0%						
Total (Wald[a])		**3708**		**3682**	**100.0%**	**0.92 [0.77 , 1.10]**
Total events:	537		570			
Test for overall effect: Z = 0.91 (P = 0.36)						
Test for subgroup differences: Chi² = 1.93, df = 2 (P = 0.38), I² = 0%						
Heterogeneity: Tau² (DL[b]) = 0.03; Chi² = 21.04, df = 16 (P = 0.18); I² = 24%						



Footnotes

[a]CI calculated by Wald-type method.

[b]Tau² calculated by DerSimonian and Laird method.

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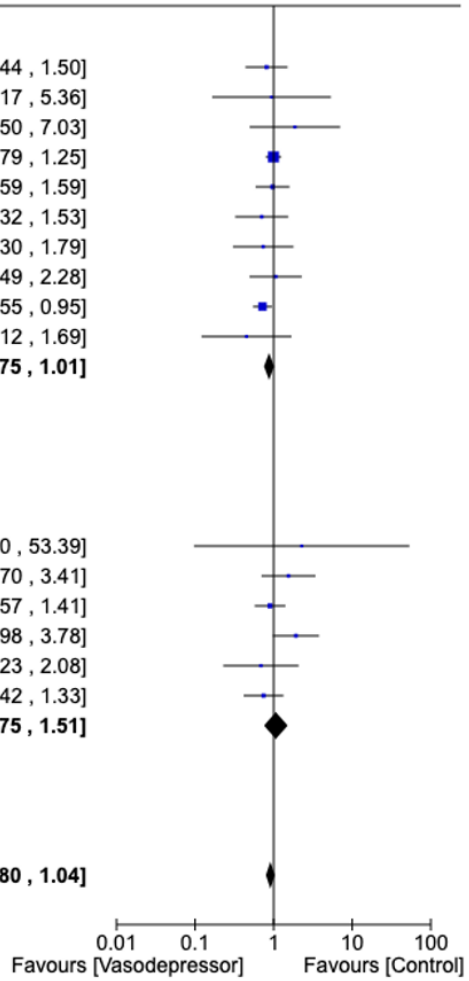
ESO EUROPEAN STROKE ORGANISATION

Death within 3 to 6 months stratified by **intervention type** to treatment

Study or Subgroup	Vasodepressor Events	Total	Control Events	Total	Weight	Odds ratio M-H, Random, 95% CI
1.2.1 BP target–based interventions						
INTERACT 2008	21	203	25	201	4.6%	0.81 [0.44 , 1.50]
Koch 2008	3	20	3	19	0.6%	0.94 [0.17 , 5.36]
ICH ADAPT 2013	7	37	4	36	1.0%	1.87 [0.50 , 7.03]
INTERACT-2 2013	166	1394	170	1421	33.3%	0.99 [0.79 , 1.25]
ATACH-2 2016	33	500	34	500	7.0%	0.97 [0.59 , 1.59]
PATICH 2017	13	96	18	99	2.9%	0.70 [0.32 , 1.53]
Gupta 2018	11	59	14	59	2.2%	0.74 [0.30 , 1.79]
CHASE 2020	16	126	14	116	2.9%	1.06 [0.49 , 2.28]
INTERACT-4 2024	125	515	156	507	22.7%	0.72 [0.55 , 0.95]
ICH ADAPT-2 2025	4	42	7	37	1.0%	0.45 [0.12 , 1.69]
Subtotal (Wald[a])		**2992**		**2995**	**78.2%**	**0.87 [0.75 , 1.01]**
Total events:	399		445			
Test for overall effect: Z = 1.77 (P = 0.08)						
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 6.23, df = 9 (P = 0.72); I² = 0%						
1.2.2 Fixed-antihypertensive agent interventions						
CHHIPS 2009	2	18	0	7	0.2%	2.27 [0.10 , 53.39]
SCAST 2014	18	144	11	130	2.8%	1.55 [0.70 , 3.41]
ENOS 2016	42	309	47	316	8.6%	0.90 [0.57 , 1.41]
RIGHT-2 2019	35	73	23	71	3.8%	1.92 [0.98 , 3.78]
MR ASAP 2022	16	35	11	20	1.4%	0.69 [0.23 , 2.08]
Dong 2024	25	137	33	143	5.1%	0.74 [0.42 , 1.33]
Subtotal (Wald[a])		**716**		**687**	**21.8%**	**1.07 [0.75 , 1.51]**
Total events:	138		125			
Test for overall effect: Z = 0.36 (P = 0.72)						
Heterogeneity: Tau² (DL[b]) = 0.04; Chi² = 6.57, df = 5 (P = 0.26); I² = 24%						
Total (Wald[a])		**3708**		**3682**	**100.0%**	**0.91 [0.80 , 1.04]**
Total events:	537		570			
Test for overall effect: Z = 1.43 (P = 0.15)						
Test for subgroup differences: Chi² = 1.07, df = 1 (P = 0.30), I² = 6.4%						
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 13.95, df = 15 (P = 0.53); I² = 0%						



Footnotes

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[b]Tau² calculated by DerSimonian and Laird method.

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PICO 2: In adults with acute spontaneous ICH, does **altering blood pressure (BP)** to a lower target compared with either no use of BP alteration to a specific target or using targets different from the lower range, result in reduced death or dependence, death, or haematoma expansion (HE)?

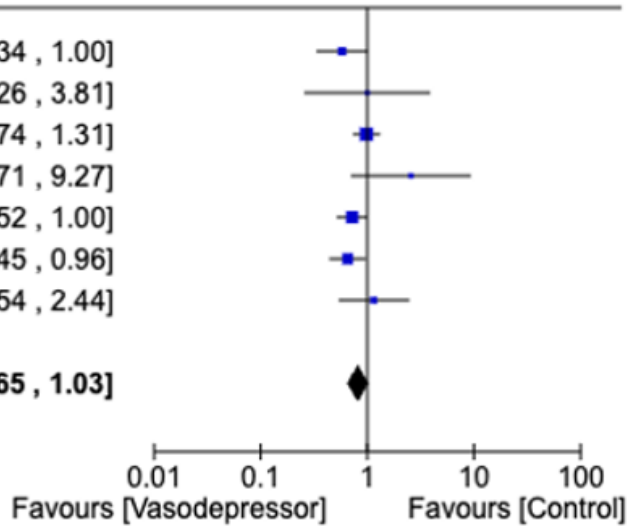
Hematoma expansion

Study or Subgroup	Vasodepressor Events	Total	Control Events	Total	Weight	Odds ratio M-H, Random, 95% CI
INTERACT 2008	26	174	40	172	13.0%	0.58 [0.34 , 1.00]
Koch 2008	6	21	6	21	2.8%	1.00 [0.26 , 3.81]
INTERACT-2 2013	128	491	125	473	27.7%	0.98 [0.74 , 1.31]
ICH ADAPT 2013	9	37	4	36	3.0%	2.57 [0.71 , 9.27]
ATACH-2 2016	85	450	104	426	24.8%	0.72 [0.52 , 1.00]
INTERACT-4 2024	55	371	76	362	20.8%	0.65 [0.45 , 0.96]
Dong 2024	16	121	15	128	7.9%	1.15 [0.54 , 2.44]
Total (Wald[a])		**1665**		**1618**	**100.0%**	**0.81 [0.65 , 1.03]**
Total events:	325		370			

Test for overall effect: Z = 1.75 (P = 0.08)

Test for subgroup differences: Not applicable

Heterogeneity: Tau² (DL[b]) = 0.03; Chi² = 8.88, df = 6 (P = 0.18); I² = 32%



Footnotes

[a]CI calculated by Wald-type method.

[b]Tau² calculated by DerSimonian and Laird method.

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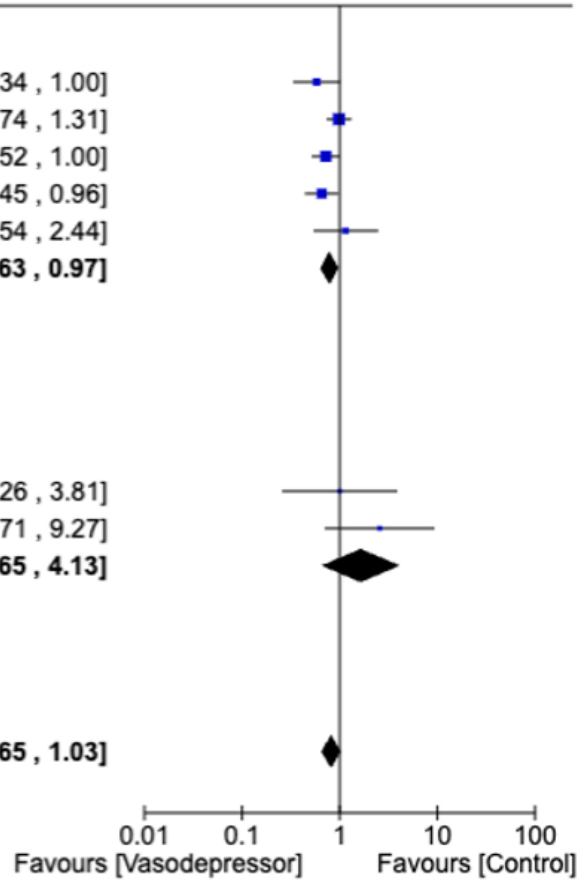
Hematoma expansion stratified by enrolment time to treatment

Study or Subgroup	Vasodepressor Events	Total	Control Events	Total	Weight	Odds ratio M-H, Random, 95% CI
6.6.1 Within 6 hours						
INTERACT 2008	26	174	40	172	13.0%	0.58 [0.34 , 1.00]
INTERACT-2 2013	128	491	125	473	27.7%	0.98 [0.74 , 1.31]
ATACH-2 2016	85	450	104	426	24.8%	0.72 [0.52 , 1.00]
INTERACT-4 2024	55	371	76	362	20.8%	0.65 [0.45 , 0.96]
Dong 2024	16	121	15	128	7.9%	1.15 [0.54 , 2.44]
Subtotal (Wald[a])		**1607**		**1561**	**94.2%**	**0.78 [0.63 , 0.97]**
Total events:	310		360			
Test for overall effect: Z = 2.24 (P = 0.02)						
Heterogeneity: Tau² (DL[b]) = 0.02; Chi² = 5.61, df = 4 (P = 0.23); I² = 29%						
6.6.2 Within 24 hours						
Koch 2008	6	21	6	21	2.8%	1.00 [0.26 , 3.81]
ICH ADAPT 2013	9	37	4	36	3.0%	2.57 [0.71 , 9.27]
Subtotal (Wald[a])		**58**		**57**	**5.8%**	**1.64 [0.65 , 4.13]**
Total events:	15		10			
Test for overall effect: Z = 1.04 (P = 0.30)						
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 1.00, df = 1 (P = 0.32); I² = 0%						
Total (Wald[a])		**1665**		**1618**	**100.0%**	**0.81 [0.65 , 1.03]**
Total events:	325		370			
Test for overall effect: Z = 1.75 (P = 0.08)						
Test for subgroup differences: Chi² = 2.32, df = 1 (P = 0.13), I² = 56.8%						
Heterogeneity: Tau² (DL[b]) = 0.03; Chi² = 8.88, df = 6 (P = 0.18); I² = 32%						



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Footnotes

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[b]Tau² calculated by DerSimonian and Laird method.

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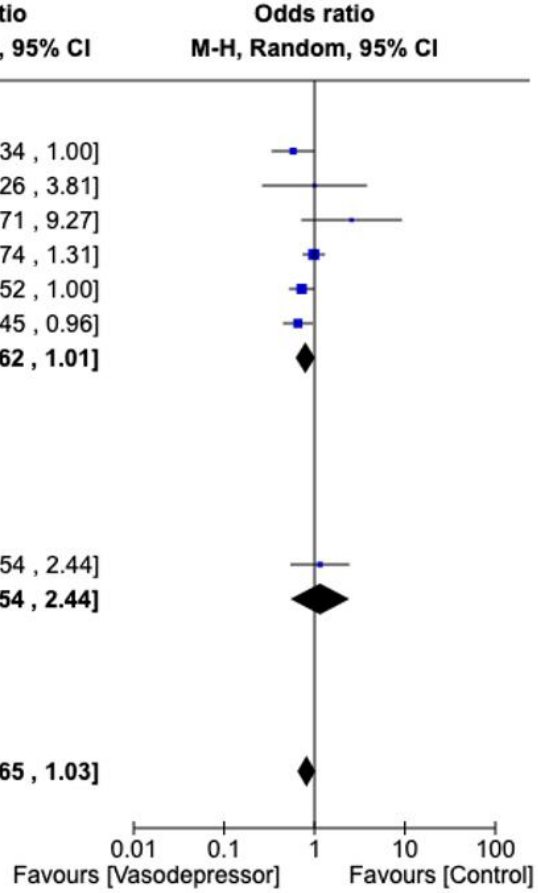
Hematoma expansion stratified by intervention type

Study or Subgroup	Vasodepressor Events	Vasodepressor Total	Control Events	Control Total	Weight	Odds ratio M-H, Random, 95% CI
1.3.1 BP target–based interventions						
INTERACT 2008	26	174	40	172	13.0%	0.58 [0.34 , 1.00]
Koch 2008	6	21	6	21	2.8%	1.00 [0.26 , 3.81]
ICH ADAPT 2013	9	37	4	36	3.0%	2.57 [0.71 , 9.27]
INTERACT-2 2013	128	491	125	473	27.7%	0.98 [0.74 , 1.31]
ATACH-2 2016	85	450	104	426	24.8%	0.72 [0.52 , 1.00]
INTERACT-4 2024	55	371	76	362	20.8%	0.65 [0.45 , 0.96]
Subtotal (Wald[a])		**1544**		**1490**	**92.1%**	**0.79 [0.62 , 1.01]**
Total events:	309		355			
Test for overall effect: Z = 1.85 (P = 0.06)						
Heterogeneity: Tau² (DL[b]) = 0.03; Chi² = 8.03, df = 5 (P = 0.15); I² = 38%						
1.3.2 Fixed-antihypertensive agent interventions						
Dong 2024	16	121	15	128	7.9%	1.15 [0.54 , 2.44]
Subtotal		**121**		**128**	**7.9%**	**1.15 [0.54 , 2.44]**
Total events:	16		15			
Test for overall effect: Z = 0.36 (P = 0.72)						
Heterogeneity: Not applicable						
Total (Wald[a])		**1665**		**1618**	**100.0%**	**0.81 [0.65 , 1.03]**
Total events:	325		370			
Test for overall effect: Z = 1.75 (P = 0.08)						
Test for subgroup differences: Chi² = 0.85, df = 1 (P = 0.36), I² = 0%						
Heterogeneity: Tau² (DL[b]) = 0.03; Chi² = 8.88, df = 6 (P = 0.18); I² = 32%						



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[b]Tau² calculated by DerSimonian and Laird method.

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To summarize…

Expert consensus suggests: SBP <140 mmHg within 6h to reduce HE

Overall pooled effects

Good functional outcome (mRS 0–2, 3–6 months): *No clear overall benefit of intensive BP lowering*

Death (3–6 months): *No clear overall reduction in mortality with lower BP targets*

Haematoma expansion (HE): *Reduction in HE with lower BP targets*

By time to treatment

Earlier treatment (within 6 h): more favourable signal for: ↓ *HE, possible trend toward better functional outcome, mortality benefit remains uncertain.*

Later treatment: *Little/no effect on functional outcome or mortality. Smaller/uncertain effect on HE.*

By intervention type

BP/target-based interventions: *More favourable signal for:* ↓ *HE, improved survival/functional outcome.*

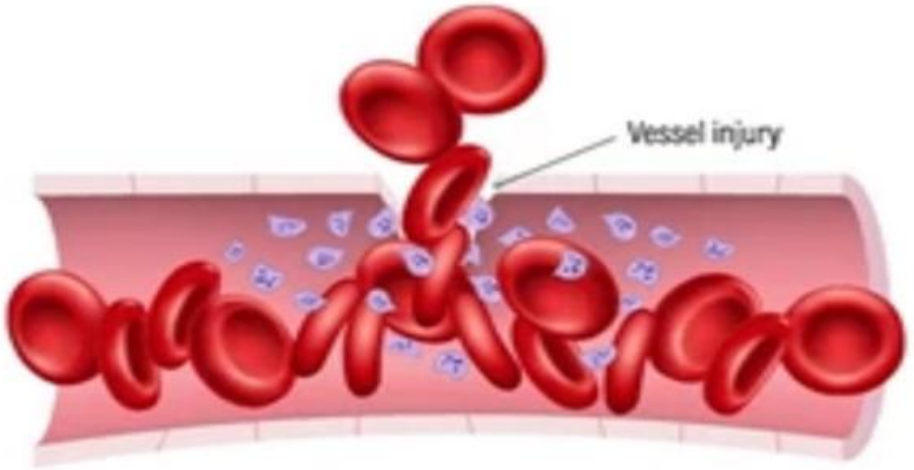
Fixed antihypertensive agent interventions: *Weaker or no effect on HE with similar outcomes for death* and dependency.

Summary Cont..

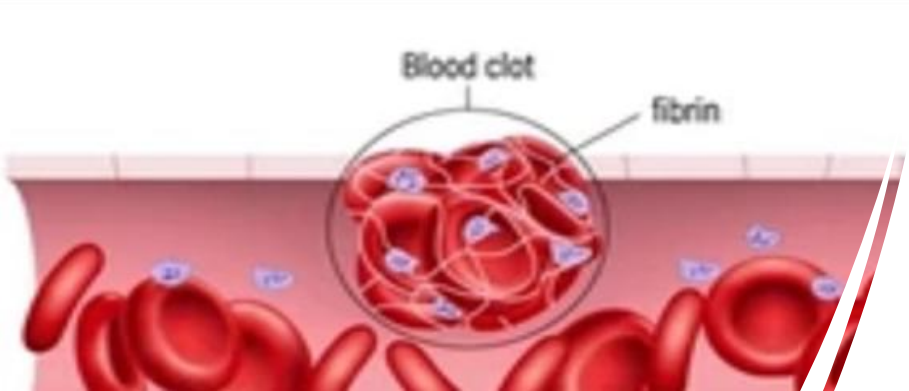
- **Certainty of evidence (GRADE):** Low quality overall → substantial uncertainty about net clinical benefit.
- Substantial clinical and methodological heterogeneity across included studies (intervention protocols, patient characteristics, timing, and outcome definitions)
- Random effects models may inadequately account for heterogeneity –> “small studies effect” anchoring pooled estimates and limiting the influence of larger, later trials.
- More RCTs are needed!

Thank you for your attention!

Damage blood vessel



Platelet plug formation



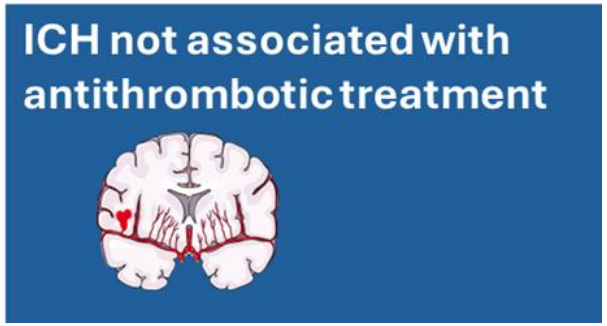
Helle Eilertsen
Norway

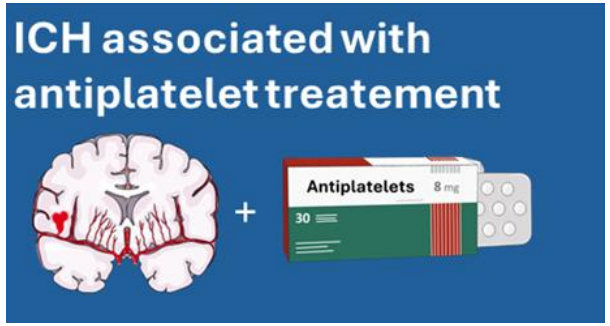
Haemostatic treatment

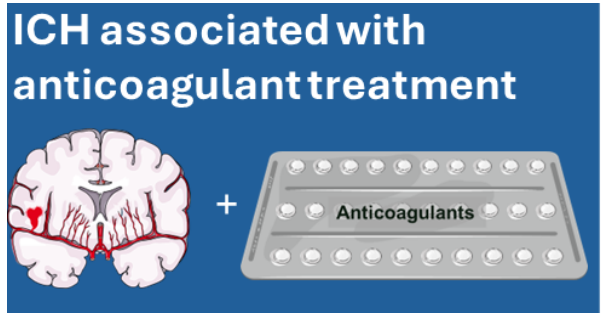
Case

- 75-year-old woman
- Symptoms: Acute right hemiparesis
- Time since symptom onset: 1.5 hours

Current medication?







ICH not associated with antithrombotic treatment

Recombinant fVIIa

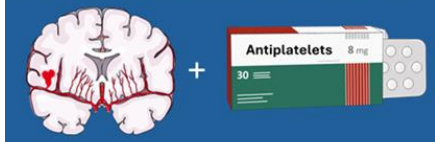
Evidence-based Recommendation
For adults with spontaneous ICH not associated with antithrombotic drug use, there is uncertainty about the balance of beneficial and adverse effects of rFVIIa, so we suggest against its routine use and suggest recruitment to ongoing randomised controlled trials.
Quality of evidence: Very Low ⊕
Strength of recommendation: Weak against intervention ↓?

Tranexamic acid

Evidence-based Recommendation
For adults with spontaneous ICH not associated with antithrombotic drug use, there is uncertainty about the balance of clinical benefits (functional outcome, death and dependence) and adverse effects of tranexamic acid. Therefore, we recommend recruitment to ongoing randomised controlled trials.
Quality of evidence: Low ⊕⊕
Strength of recommendation: –

Expert consensus statement
Tranexamic acid may be considered for reducing haematoma expansion, if enrolment in an ongoing randomised controlled trial is not possible.
Vote: 13/15

ICH associated with antiplatelet treatement



Platelet transfusion

Evidence-based Recommendation
In adults with spontaneous ICH associated with antiplatelet drug use we suggest against the use of platelet transfusion.
Quality of evidence: Moderate ⊕⊕⊕
Strength of recommendation: Weak against intervention ↓?

Desmopressin

Evidence-based Recommendation
In adults with spontaneous ICH associated with antiplatelet drug use, there is uncertainty about the beneficial and adverse effects of desmopressin, so we recommend inclusion in ongoing randomised controlled trials.
Quality of evidence: Very low ⊕
Strength of recommendation: -

ICH associated with anticoagulant treatment

PCC vs FFP in VKA-associated ICH

Evidence-based Recommendation
In adults with ICH associated with use of vitamin K-antagonists (VKA), there is continuing uncertainty about the beneficial and adverse effects of PCC versus FFP on clinical outcomes.
Quality of evidence: Very low ⊕
Strength of recommendation: -

Expert consensus statement
In adults with ICH associated with use of vitamin K-antagonists (VKA), we suggest using 4-factor PCC dosages in the range from 30 to 50 IU/kg if INR ≥ 2.0 and 10 IU/kg if INR is 1.3–1.9 combined with use of intravenous vitamin K (10 mg) to normalise and prevent subsequent increase of INR.
Vote: 15/15

PCC in fXaI-associated ICH

Evidence-based Recommendation
For adults with spontaneous ICH associated with factor Xa-inhibitor use there is uncertainty about the balance of beneficial and adverse effects of PCC, so we recommend recruitment to further randomised controlled trials.
Quality of evidence: Very low ⊕
Strength of recommendation: -

Expert consensus statement
For adults with spontaneous ICH associated with factor Xa-inhibitor use PCC may be considered, but clinicians should carefully consider the balance between its unknown benefit for reducing haematoma expansion and poor clinical outcome, and the potential increase in thromboembolic events.
Vote: 15/15

TXA in fXaI-associated ICH

Evidence-based Recommendation
For adults with acute spontaneous ICH associated with use of factor Xa-inhibitors (FXaI, apixaban, edoxaban, rivaroxaban), there is uncertainty about the beneficial and adverse effects of TXA, therefore we recommend recruitment to ongoing randomised controlled trials.
Quality of evidence: Low ⊕⊕
Strength of recommendation: -

Andexanet alfa in fXaI-associated ICH

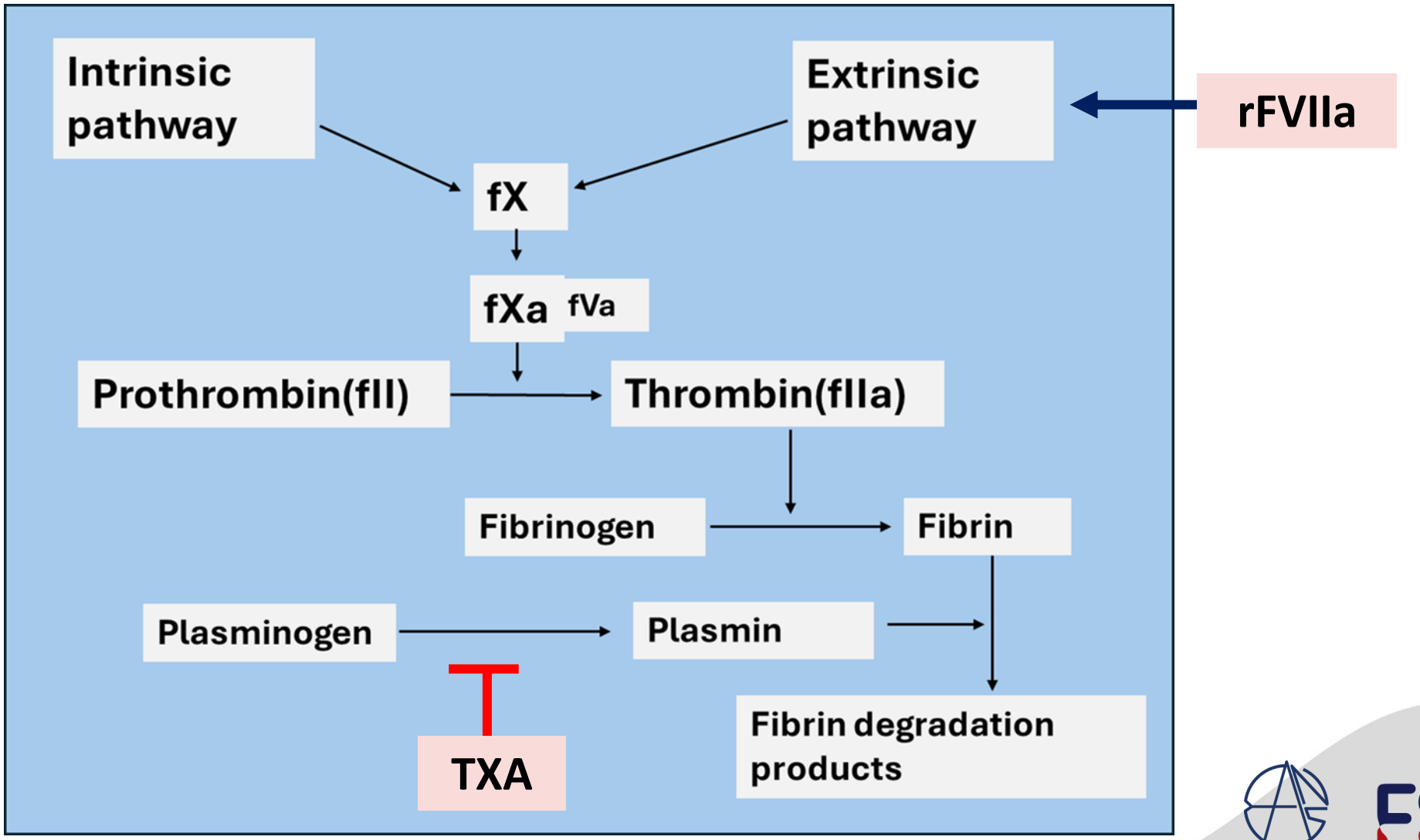
Evidence-based Recommendation
In adults with acute spontaneous ICH associated with use of factor Xa-inhibitor (i.e. within 15 h after the last dose of apixaban, edoxaban or rivaroxaban), there is continuing uncertainty about the balance of clinical benefits (functional outcome, death and dependence) and adverse effects of andexanet alfa, so we recommend recruitment to randomised controlled trials.
Quality of evidence: Low ⊕⊕
Strength of recommendation: -

Expert consensus statement
In adults with spontaneous ICH associated with use of certain factor Xa-inhibitors (apixaban or rivaroxaban) within 15 h after the last dose of a factor Xa-inhibitor (or proven factor Anti-FXa activity > 100 ng/mL) and within 12 h since onset of symptoms we suggest considering the use of andexanet alfa to reduce haematoma expansion. The potential clinical benefit should be evaluated in sufficiently powered randomised controlled trials.
Vote: 14/15

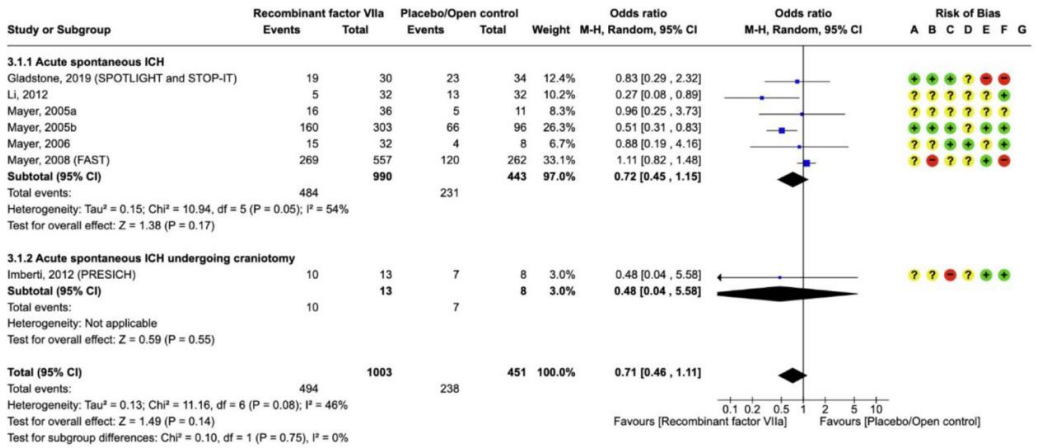
Idarucizumab in fIIaI-associated ICH

Evidence-based Recommendation
In adults with anticoagulant-associated ICH associated with the use of direct thrombin inhibitor there are no RCTs.
Quality of evidence: Very Low ⊕
Strength of recommendation: -

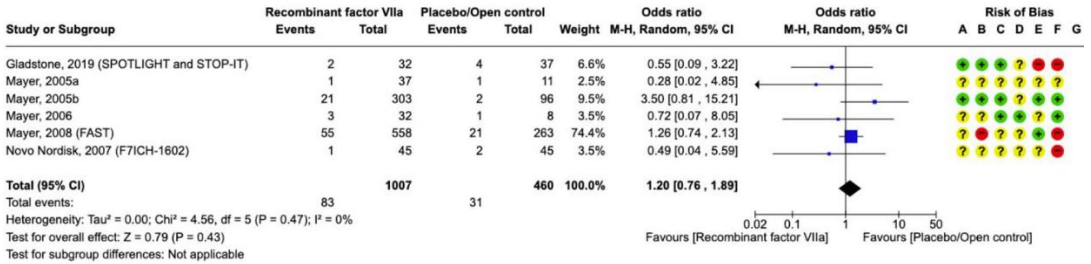
Expert consensus statement
In adults with anticoagulant-associated ICH associated with use of direct thrombin inhibitor (dabigatran) we suggest the immediate use of idarucizumab (2 × 2.5 g intravenously) to normalize the dTT (diluted thrombin time) and the ECT (ecarin clotting time).
Vote: 15/15


Intrinsic pathway
Extrinsic pathway
rFVIIa
fX
fXa
fVa
Prothrombin(fII)
Thrombin(fIIa)
Fibrinogen
Fibrin
Plasminogen
Plasmin
TXA
Fibrin degradation products

Use of recombinant factor VIIa



Death or dependence (mRS 4–6) at day 90



Thromboembolic adverse events

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ESO EUROPEAN STROKE ORGANISATION

Use of recombinant factor VIIa

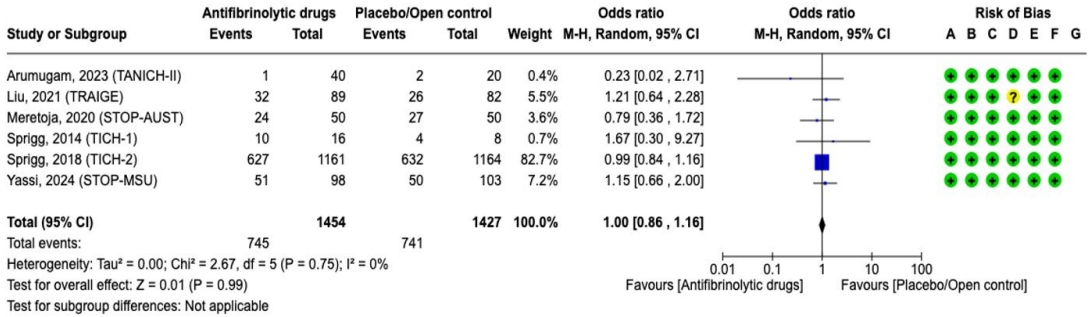
Evidence-based Recommendation

- For adults with spontaneous ICH not associated with antithrombotic drug use, there is uncertainty about the balance of beneficial and adverse effects of rFVIIa, so we suggest against its routine use and suggest recruitment to ongoing randomised controlled trials.

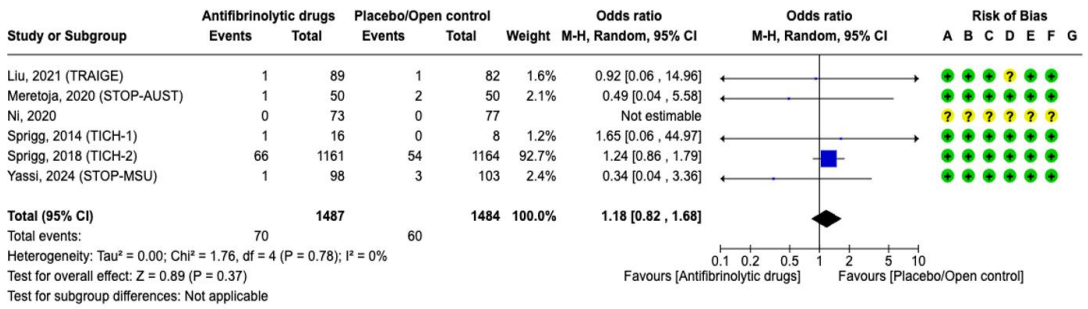
Quality of evidence: Very Low ⨁

Strength of recommendation: Weak against intervention ↓?

Use of tranexamic acid



Death or dependence (mRS 4–6) at day 90



Thromboembolic adverse events

Use of tranexamic acid

Evidence-based Recommendation

- For adults with spontaneous ICH not associated with antithrombotic drug use, there is uncertainty about the balance of clinical benefits (functional outcome, death and dependence) and adverse effects of tranexamic acid. Therefore, we recommend recruitment to ongoing randomised controlled trials.

Quality of evidence: Low ⨁⨁

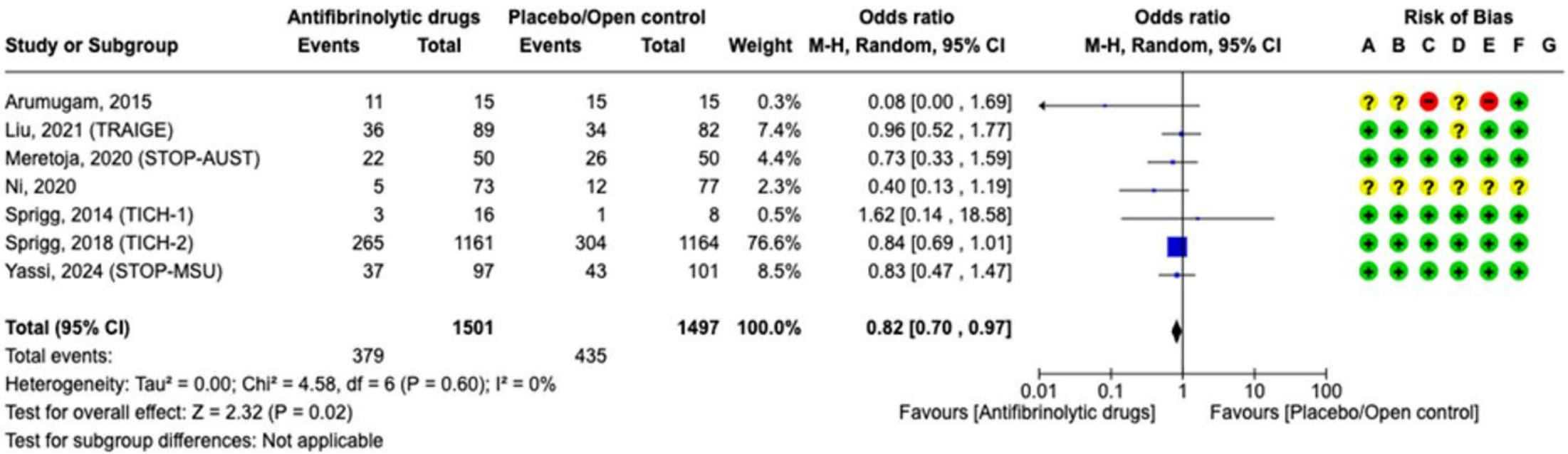
Strength of recommendation: Weak for intervention ↑?

Expert consensus statement

Tranexamic acid may be considered for **reducing haematoma expansion**, if enrolment in an ongoing randomised controlled trial is not possible.

Vote: 13 / 15

Use of tranexamic acid



Study or Subgroup	Antifibrinolytic drugs Events	Total	Placebo/Open control Events	Total	Weight	Odds ratio M-H, Random, 95% CI
Arumugam, 2015	11	15	15	15	0.3%	0.08 [0.00 , 1.69]
Liu, 2021 (TRAIGE)	36	89	34	82	7.4%	0.96 [0.52 , 1.77]
Meretoja, 2020 (STOP-AUST)	22	50	26	50	4.4%	0.73 [0.33 , 1.59]
Ni, 2020	5	73	12	77	2.3%	0.40 [0.13 , 1.19]
Sprigg, 2014 (TICH-1)	3	16	1	8	0.5%	1.62 [0.14 , 18.58]
Sprigg, 2018 (TICH-2)	265	1161	304	1164	76.6%	0.84 [0.69 , 1.01]
Yassi, 2024 (STOP-MSU)	37	97	43	101	8.5%	0.83 [0.47 , 1.47]
Total (95% CI)		**1501**		**1497**	**100.0%**	**0.82 [0.70 , 0.97]**
Total events:	379		435			

Heterogeneity: Tau² = 0.00; Chi² = 4.58, df = 6 (P = 0.60); I² = 0%
Test for overall effect: Z = 2.32 (P = 0.02)
Test for subgroup differences: Not applicable

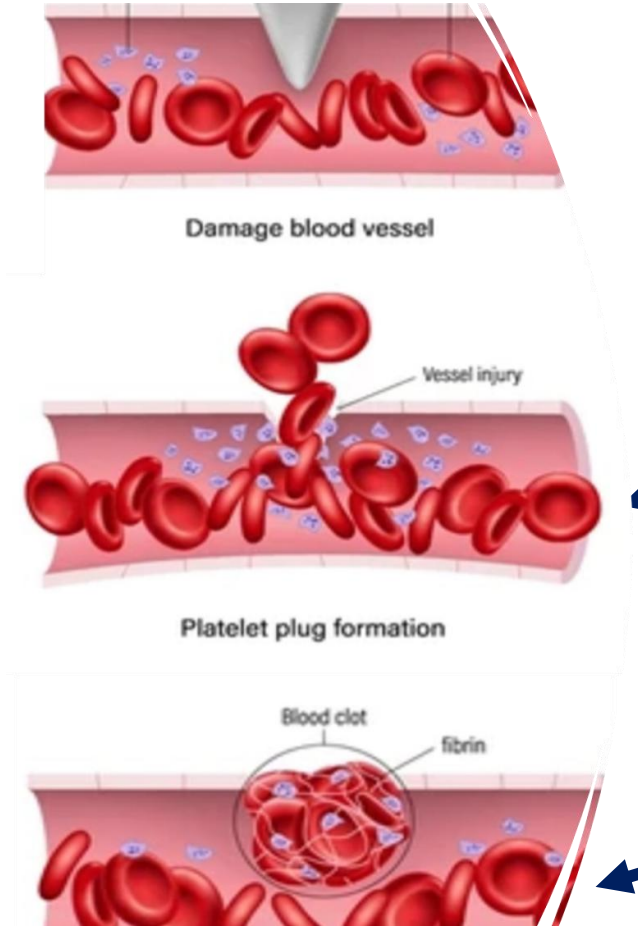
Haematoma expansion by 24 hours

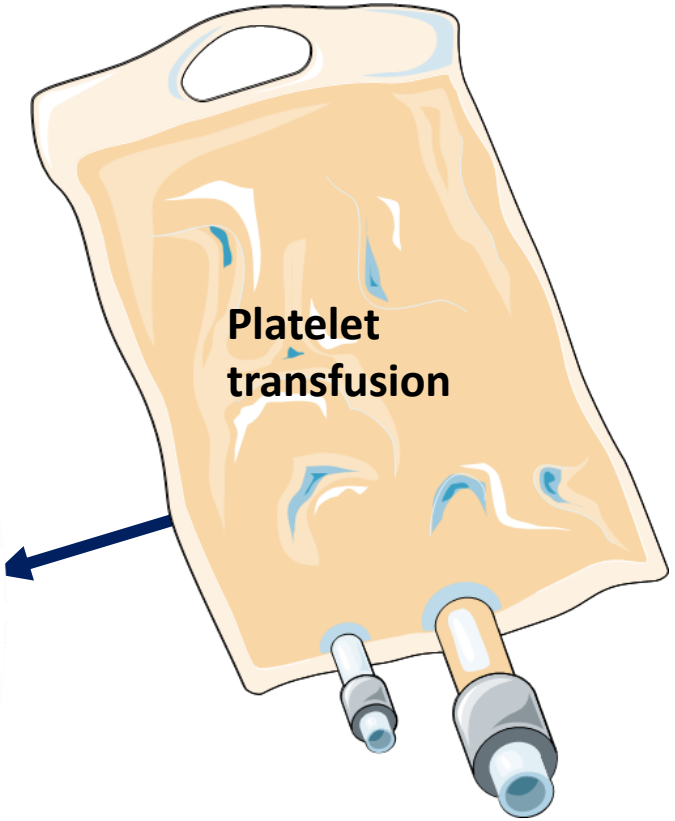
Case

- 75-year-old woman
- Symptoms: Acute right hemiparesis
- Time since symptom onset: 1.5 hours

Current medication?

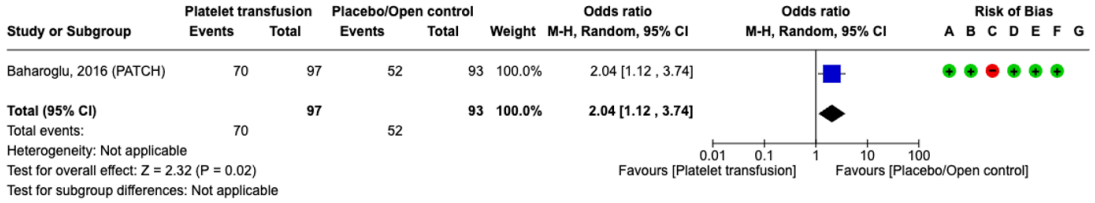
- Uncertainty about the use of rVIIa and TXA
- Enrol patients in RCTs
- If no TXA-RCT available, consider giving TXA



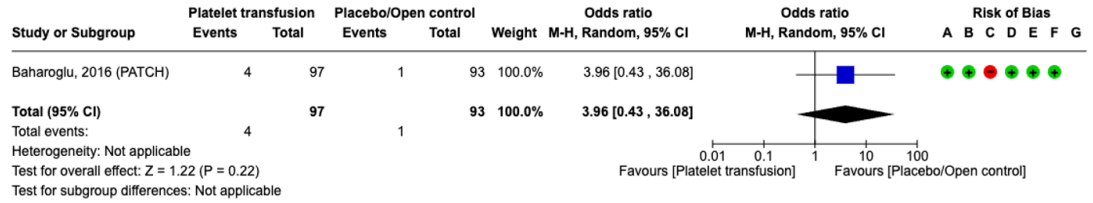


Desmopressin

Platelet transfusion



Death or dependence (mRS 4–6) at day 90



Thromboembolic adverse events

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ESO EUROPEAN STROKE ORGANISATION

Platelet transfusion

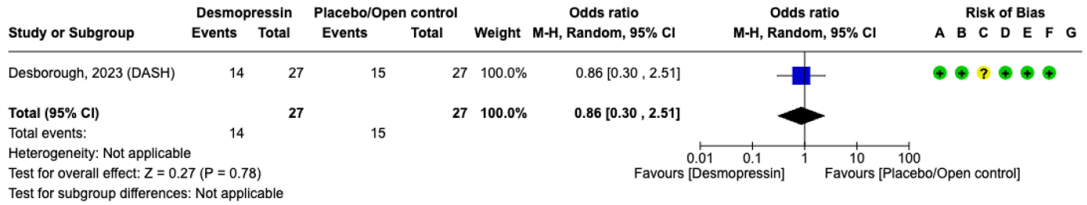
Evidence-based Recommendation

- In adults with spontaneous ICH associated with antiplatelet drug use we suggest **against** the use of platelet transfusion.

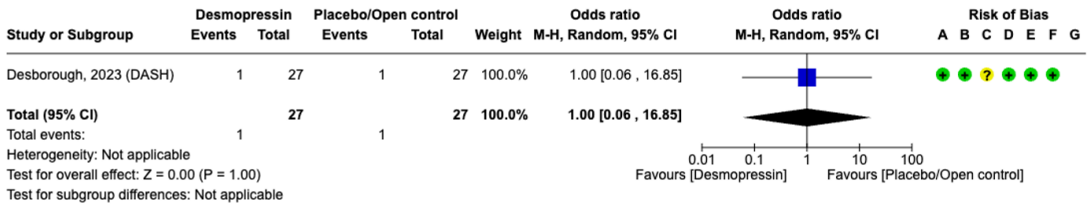
Quality of evidence: Moderate ⨁⨁⨁

Strength of recommendation: Weak against intervention ↓?

Desmopressin



Death or dependence (mRS 4–6) at day 90



Thromboembolic adverse events

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Desmopressin

Evidence-based Recommendation

- In adults with spontaneous ICH associated with antiplatelet drug use, there is uncertainty about the beneficial and adverse effects of **desmopressin**, so we recommend inclusion in ongoing randomised controlled trials.

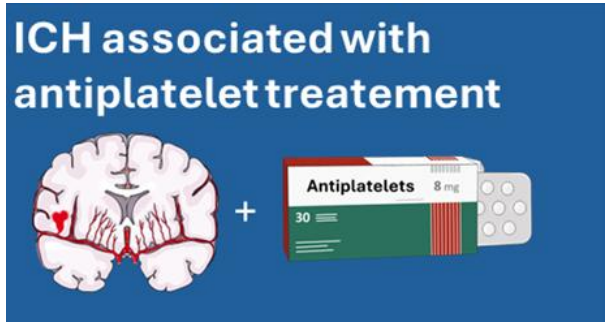
Quality of evidence: Very low ⨁

Strength of recommendation: -

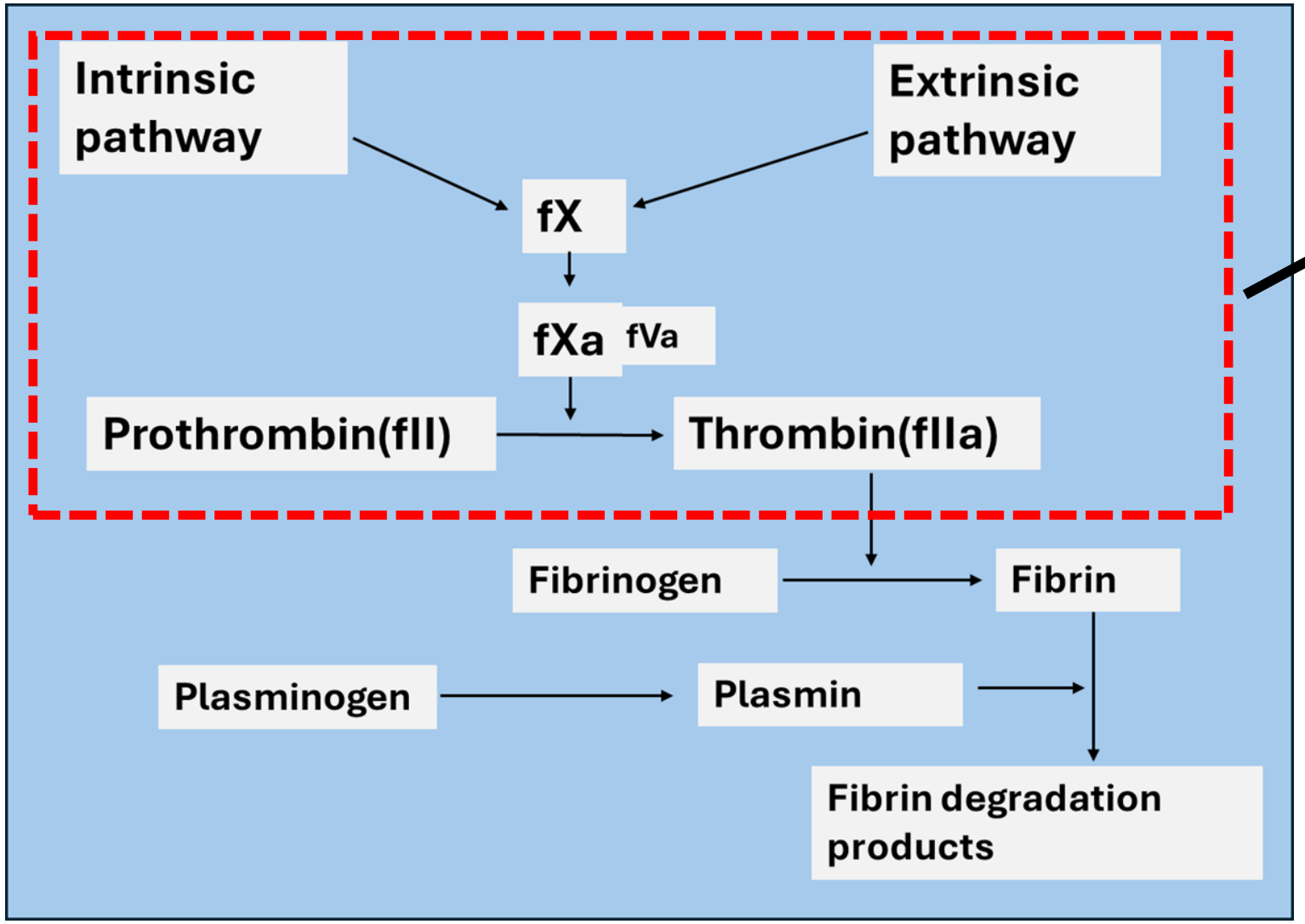
Case

- 75-year-old woman
- Symptoms: Acute right hemiparesis
- Time since symptom onset: 1.5 hours

Current medication?



- Avoid platelet transfusion
- Uncertainty about desmopressin, include in RCTs



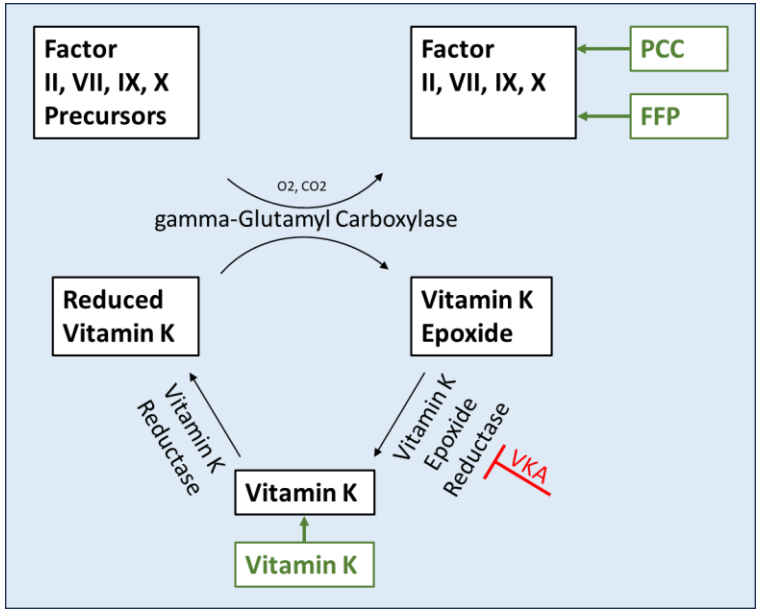


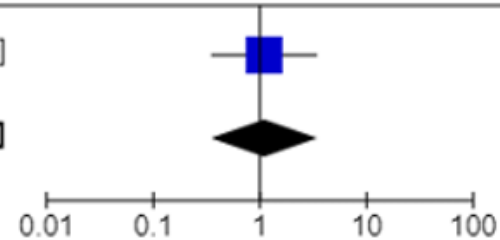
Figure modified from Sabine Eichinger et al, Reversing vitamin K antagonists: making the old new again, Hematology Am Soc Hematol Educ Program, 2016

VKA = Vitamin K antagonist
PCC = prothrombin complex concentrate
FFP = fresh frozen plasma

PCC versus FFP for VKA-associated ICH

Study or Subgroup	Prothrombin complex concentrates Events	Total	Fresh frozen plasma Events	Total	Weight	Odds ratio M-H, Random, 95% CI
Steiner, 2016 (INCH)	17	27	14	23	100.0%	1.09 [0.35 , 3.43]
Total (95% CI)		**27**		**23**	**100.0%**	**1.09 [0.35 , 3.43]**
Total events:	17		14			

Heterogeneity: Not applicable
Test for overall effect: Z = 0.15 (P = 0.88)
Test for subgroup differences: Not applicable



Death or dependence (mRS 4–6) at 90 days

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PCC versus FFP for VKA-associated ICH

Evidence-based Recommendation

- In adults with ICH associated with use of vitamin K-antagonists (VKA), there is continuing uncertainty about the beneficial and adverse effects of PCC versus FFP on clinical outcomes.

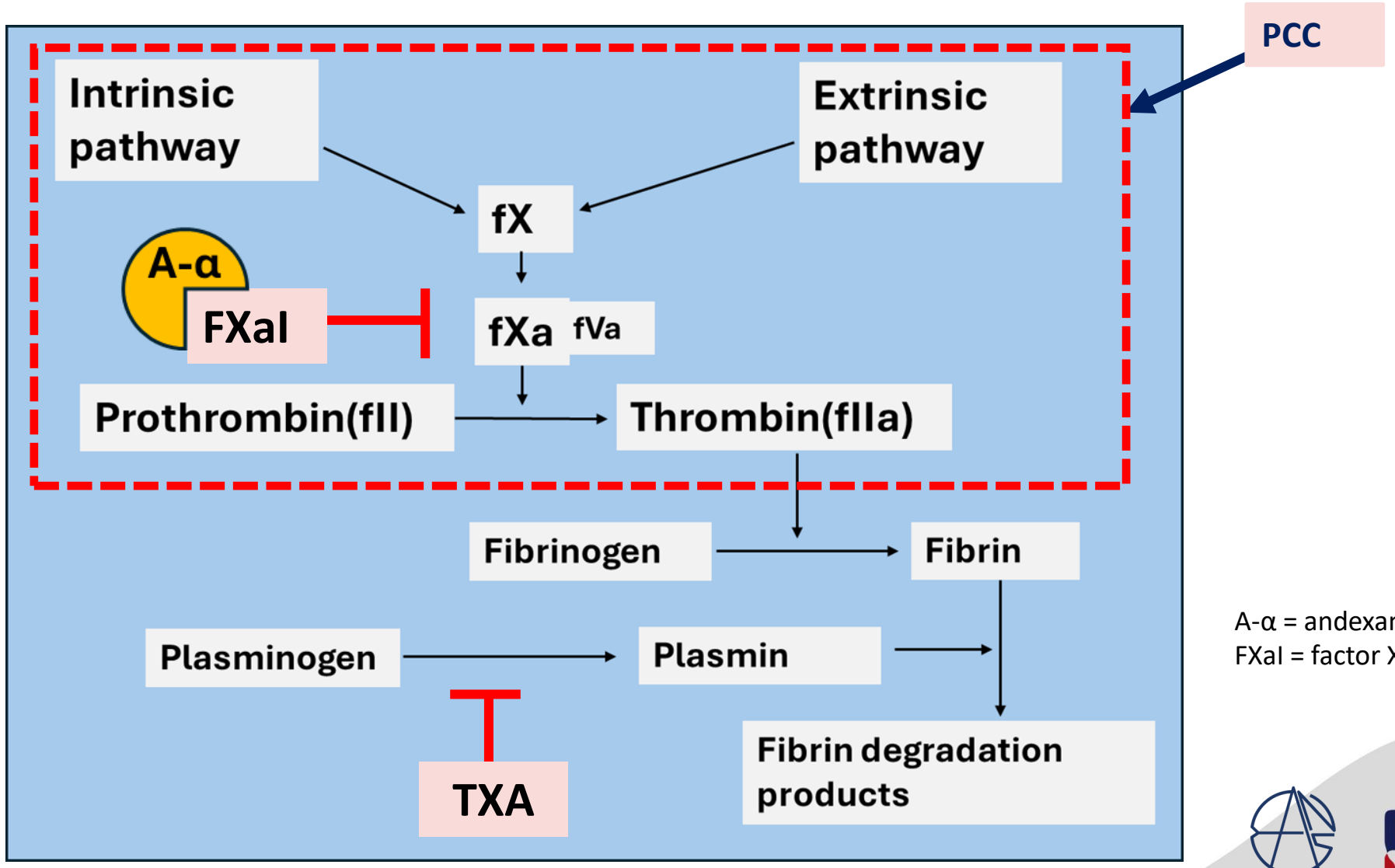
Quality of evidence: Very low ⨁

Strength of recommendation: -

Expert consensus statement

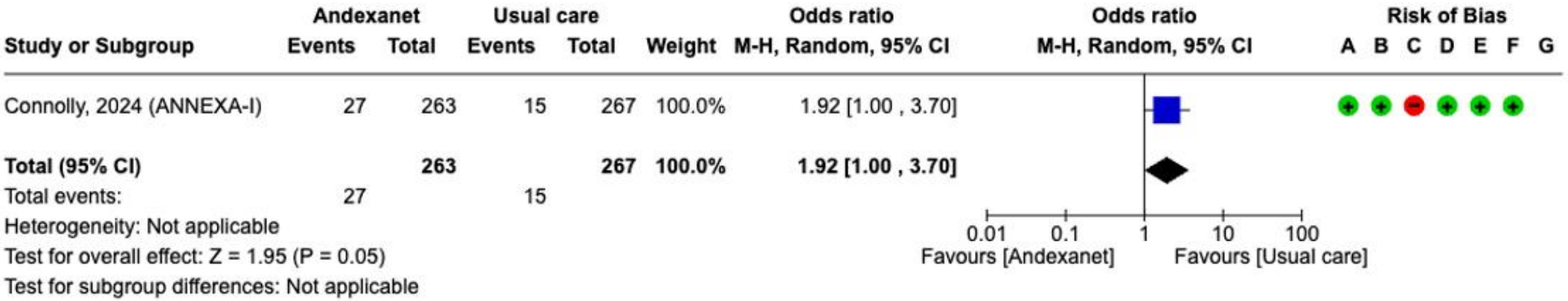
In adults with ICH associated with use of vitamin K-antagonists (VKA), we suggest using **4-factor PCC** dosages in the range from **30 to 50 IU/kg if INR ≥ 2.0** and **10 IU/kg if INR is 1.3 to 1.9** combined with use of intravenous **vitamin K (10 mg)** to normalise and prevent subsequent increase of INR.

Vote: 15 / 15



A-α = andexanet alfa
FXaI = factor Xa inhibitor

Andexanet alfa for ICH associated with FXaI



Thromboembolic adverse events

Andexanet alfa for ICH associated with FXaI

Evidence-based Recommendation

- In adults with acute spontaneous ICH associated with use of factor Xa-inhibitor (FXaI, i.e. within 15 hours after the last dose of apixaban, edoxaban, or rivaroxaban), there is **continuing uncertainty** about the balance of clinical benefits (functional outcome, death and dependence) and adverse effects of andexanet alfa, so we recommend recruitment to randomised controlled trials.

Quality of evidence: Low ⨁⨁

Strength of recommendation: -

Expert consensus statement

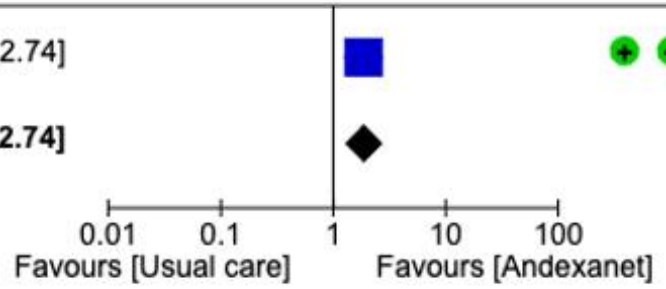
In adults with spontaneous ICH associated with use of factor Xa-inhibitor (FXaI, **apixaban**, **rivaroxaban**) **within 15 hours** after the last dose of a FXaI (or proven factor Anti-FXa activity > 100 ng/ml) and **within 12 hours since onset of symptoms** we suggest **considering** the use of Andexanet alfa to reduce haematoma expansion. The potential clinical benefit should be evaluated in sufficiently powered randomised controlled trials.

Vote 14 / 15

Andexanet alfa for ICH associated with FXaI

Study or Subgroup	Andexanet Events	Andexanet Total	Usual care Events	Usual care Total	Weight	Odds ratio M-H, Random, 95% CI	Risk of Bias A B C D E F G
Connolly, 2024 (ANNEXA-I)	187	247	156	249	100.0%	1.86 [1.26 , 2.74]	+ + − + + +
Total (95% CI)		**247**		**249**	**100.0%**	**1.86 [1.26 , 2.74]**	
Total events:	187		156				

Heterogeneity: Not applicable
Test for overall effect: Z = 3.13 (P = 0.002)
Test for subgroup differences: Not applicable



Haematoma expansion by 24 hours

PCC in fXaI-associated ICH

Evidence-based Recommendation

- For adults with spontaneous ICH associated with factor Xa-inhibitor (FXaI) there is **uncertainty** about the balance of beneficial and adverse effects of PCC, so we recommend recruitment to further randomised controlled trials.

Quality of evidence: Very low ⨁
Strength of recommendation: -

Expert consensus statement

For adults with spontaneous ICH associated with factor Xa-inhibitor (FXaI) PCC may be considered, but clinicians should carefully consider the balance between its **unknown benefit** for reducing haematoma expansion and poor clinical outcome, and the potential increase in thromboembolic events.
Vote: 15 / 15

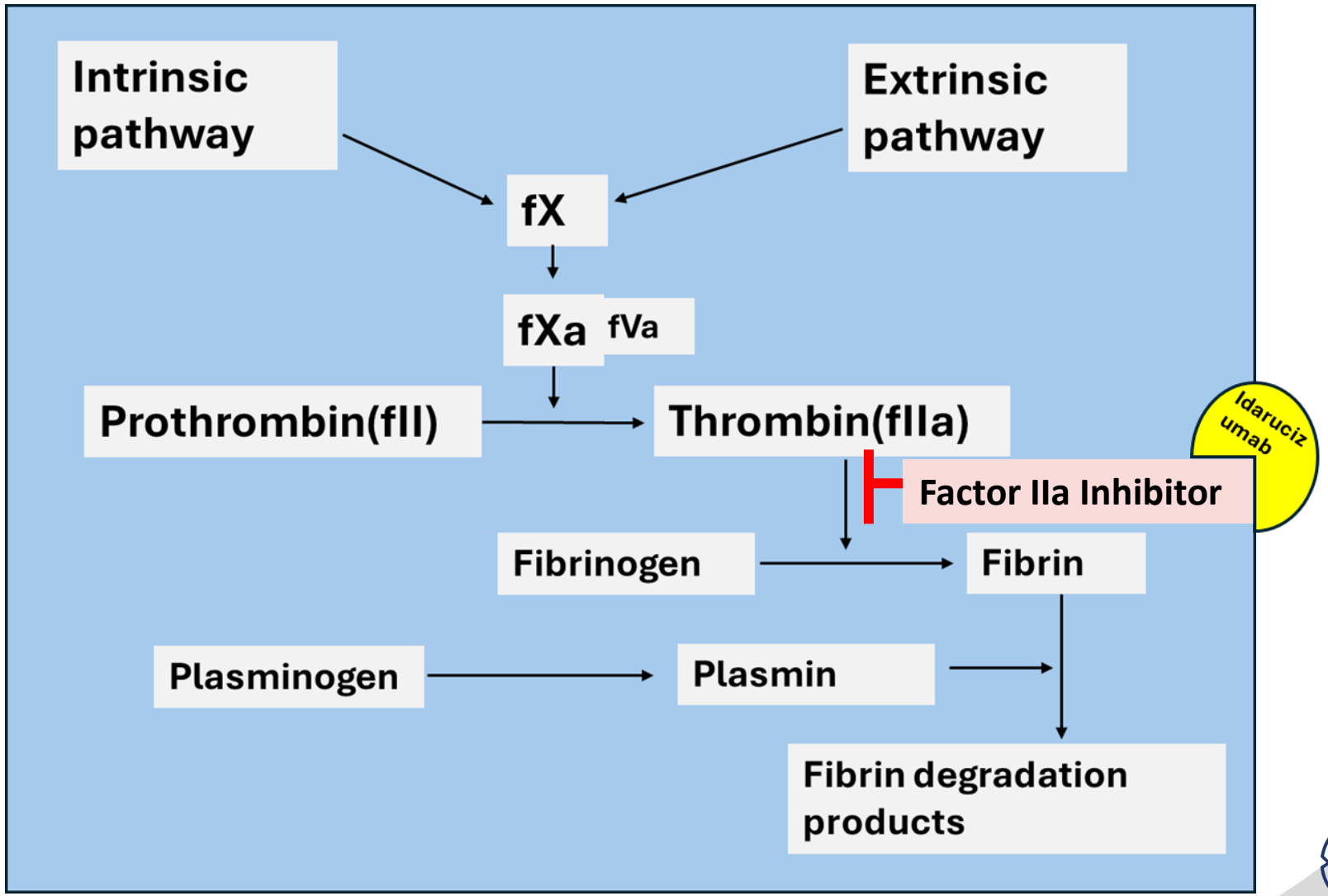
Tranexamic acid in fXaI-associated ICH

Evidence-based Recommendation

- For adults with acute spontaneous ICH associated with use of factor Xa-inhibitors (FXaI, apixaban, edoxaban, rivaroxaban), there is uncertainty about the beneficial and adverse effects of TXA, therefore we recommend recruitment to ongoing randomised controlled trials.

Quality of evidence: Low ⨁⨁

Strength of recommendation: -


Intrinsic pathway
Extrinsic pathway
fX
fXa
fVa
Prothrombin(fII)
Thrombin(fIIa)
Idarucizumab
Factor IIa Inhibitor
Fibrinogen
Fibrin
Plasminogen
Plasmin
Fibrin degradation products

Idaruzicumab for ICH associated with fIIaI

Evidence-based Recommendation

- In adults with anticoagulant-associated ICH associated with the use of direct thrombin inhibitor there are **no RCTs**.

Quality of evidence: Very Low ⨁

Strength of recommendation: -

Expert consensus statement

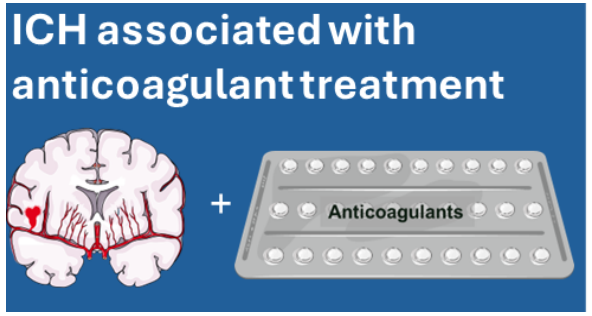
In adults with anticoagulant-associated ICH associated with use of direct thrombin inhibitor (dabigatran) we suggest the immediate use of Idarucizumab (2 x 2.5 g intravenously) to normalize the dTT (diluted thrombin time) and the ECT (ecarin clotting time).

Vote: 15 / 15

Case

- 75-year-old woman
- Symptoms: Acute right hemiparesis
- Time since symptom onset: 1.5 hours

Current medication?

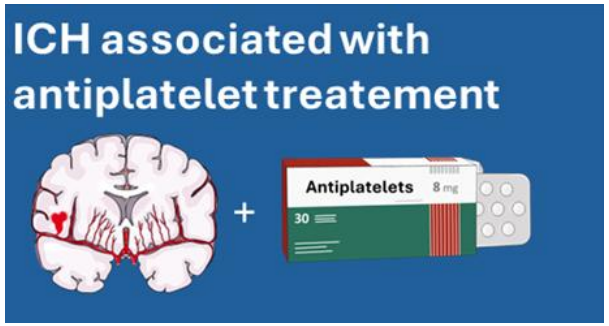


No clear evidence-based recommendations

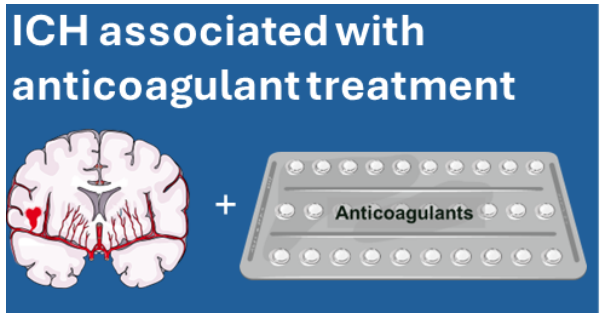
- PCC + vitamin K in VKA- associated ICH
- Consider andexanet alfa in fXaI-associated ICH
- Use Idaruzicumab in fIIaI-associated ICH

Conclusions

- Uncertainty about the use of rVIIa and TXA
- Enrol patients in RCTs
- If no TXA-RCT available, consider giving TXA



- Avoid platelet transfusion
- Uncertainty about desmopressin, include in RCTs



No clear evidence-based recommendations

- PCC + vitamin K in VKA-associated ICH
- Consider andexanet alfa in fXaI-associated ICH
- Use idaruzicumab in fIIaI-associated ICH

Jürgen Beck
Germany

Floris Schreuder
Netherlands

Surgical management

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EUROPEAN STROKE ORGANISATION

Case: 63-year-old female

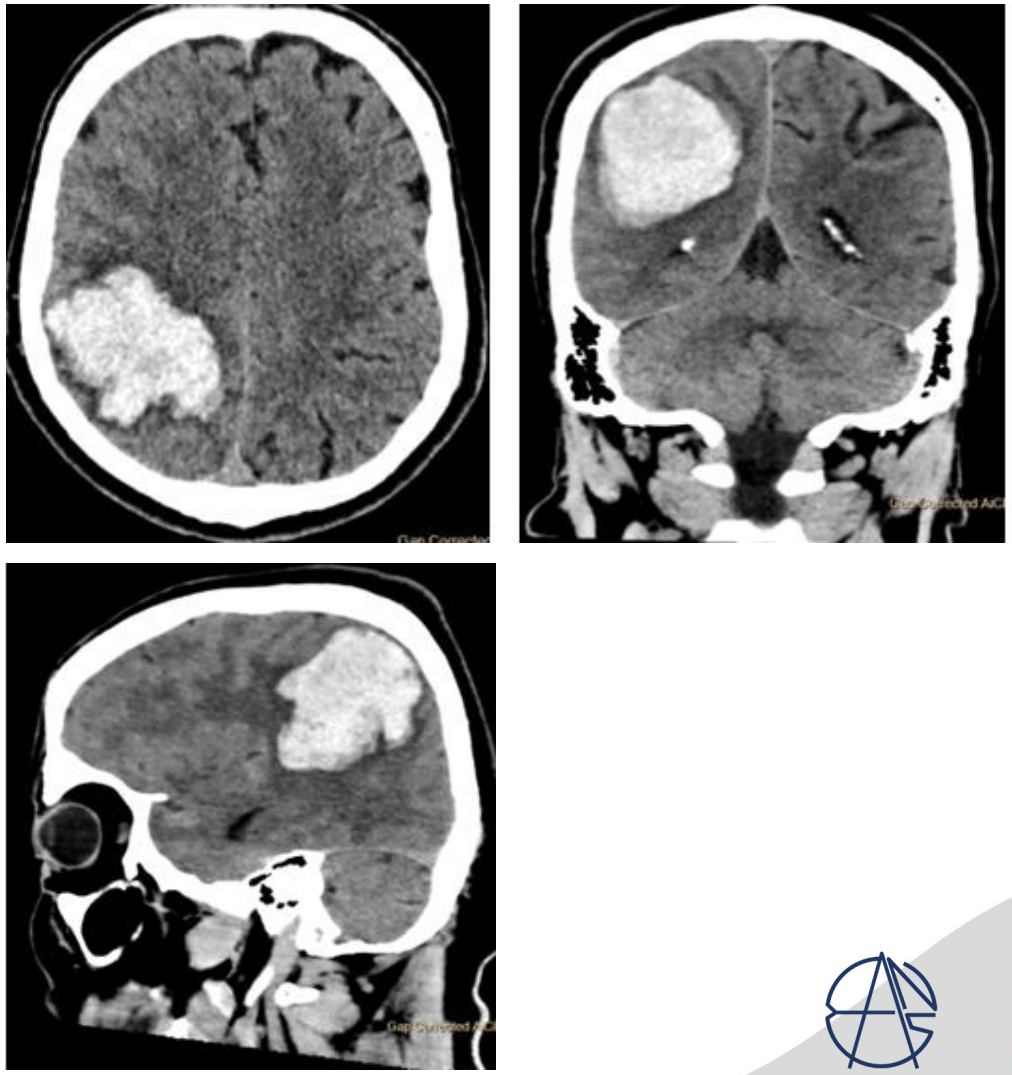
Medical history: hypertension

Acute onset of headache and left hemiparesis

In hospital 3.5h of onset

- GCS 3-6-5
- Dysarthria
- Left-sided visual neglect and hemiparesis MRC 4

NIHSS 8



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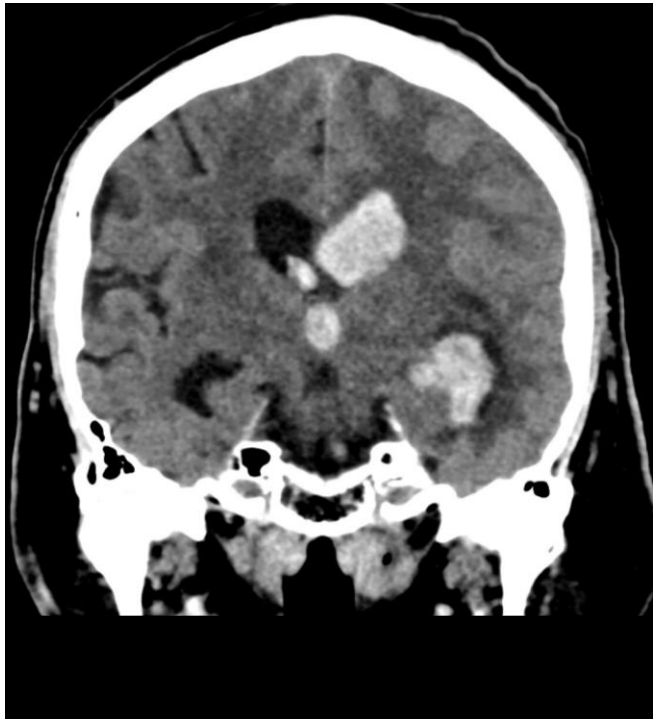
PICO 4: Surgical management

Supratentorial ICH



Intraventricular extension

Infratentorial ICH

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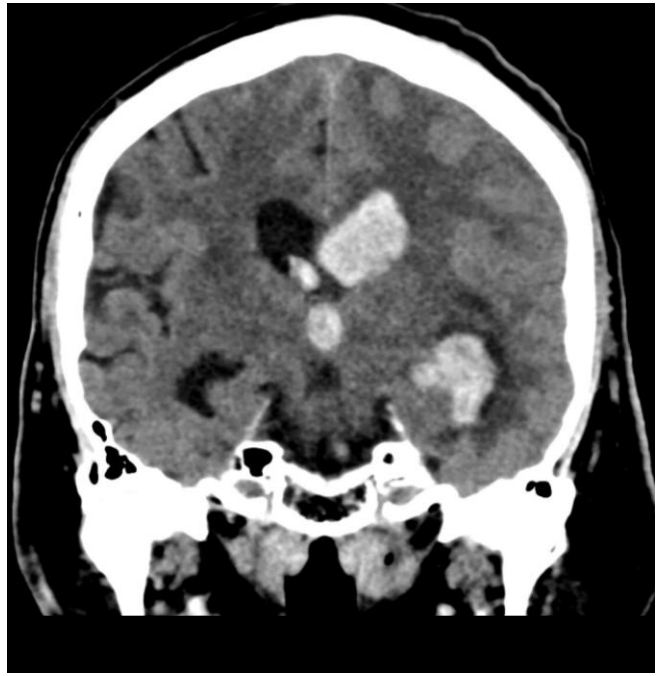
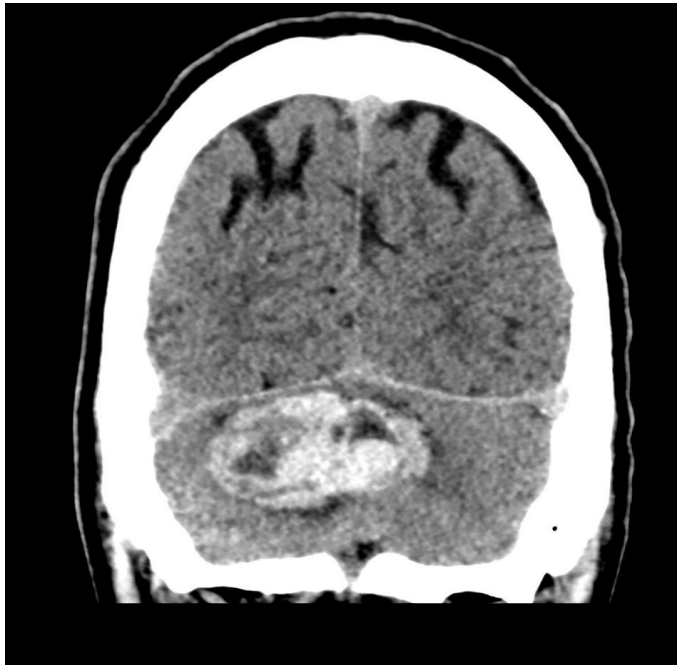
Previous ESO guideline (2014)

Recommendation
There is no evidence to support surgical intervention on a routine basis to improve outcome after supratentorial ICH in comparison with conservative management, but early surgery may be of value for patients with a GCS score 9–12.
Quality of evidence: Moderate
Strength of recommendation: Weak



Recommendation
In the absence of RCTs, we cannot make strong recommendations about how, when, and for whom to use EVD combined with intrathecal thrombolysis in spontaneous ICH.
Quality of evidence: Very low
Stength of recommendation: None



Recommendation
There is insufficient evidence from RCTs to make strong recommendations about how, when, and for whom surgical evacuation should be performed in adults with infratentorial ICH.
Quality of evidence: Low
Strength of recommendation: Weak

Steiner e.a. Int J Stroke 2014; 9(10):840-55

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Evidence-based Recommendations

Supratentorial ICH

Recommendation
There is no evidence to support surgical intervention on a routine basis to improve outcome after supratentorial ICH in comparison with conservative management, but early surgery may be of value for patients with a GCS score 9–12.
Quality of evidence: Moderate
Strength of recommendation: Weak

PICO 4.1.1:

In adult people with acute spontaneous **supratentorial** ICH, does **any surgery** aimed at clot removal versus no surgery reduce the risk of death or dependence?

Evidence-based Recommendations

Supratentorial ICH

PICO 4.1.1:

In adult people with acute spontaneous **supratentorial** ICH, does **any surgery** aimed at clot removal versus no surgery reduce the risk of death or dependence?

Evidence-based Recommendation

In adults with acute spontaneous supratentorial ICH, we suggest for a **surgical approach aiming at haematoma removal and prevention of secondary brain injury** to reduce the risk of death, or dependence, taking into account additional factors such as haematoma location and volume, the patient's neurological condition, timing, method of intervention, and the surgeon's complication rate.

Quality of evidence: Very low ⊕

Strength of recommendation: Weak for intervention ↑?

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Evidence-based Recommendations

Supratentorial ICH

PICO 4.1.1:

In adult people with acute spontaneous **supratentorial** ICH, does **any surgery** aimed at clot removal versus no surgery reduce the risk of death or dependence?

Evidence-based Recommendation

In adults with acute spontaneous supratentorial ICH, we suggest for a **surgical approach aiming at haematoma removal and prevention of secondary brain** to reduce the risk of death, or dependence, taking into account additional factors such as haematoma lo ient's neurological condition, timing, method of intervention, and the surgeon's

Quality of evidence: Very low ⊕

Strength of recommendation: Weak for intervention ↑?

Given **differences** in **results and quality of evidence** for surgical interventions, recommendations are **further specified** for **craniotomy** (PICO 4.1.2), **minimally invasive surgical removal** (PICO 4.1.3), and **surgery with catheter placement plus thrombolysis** (PICO 4.1.4).

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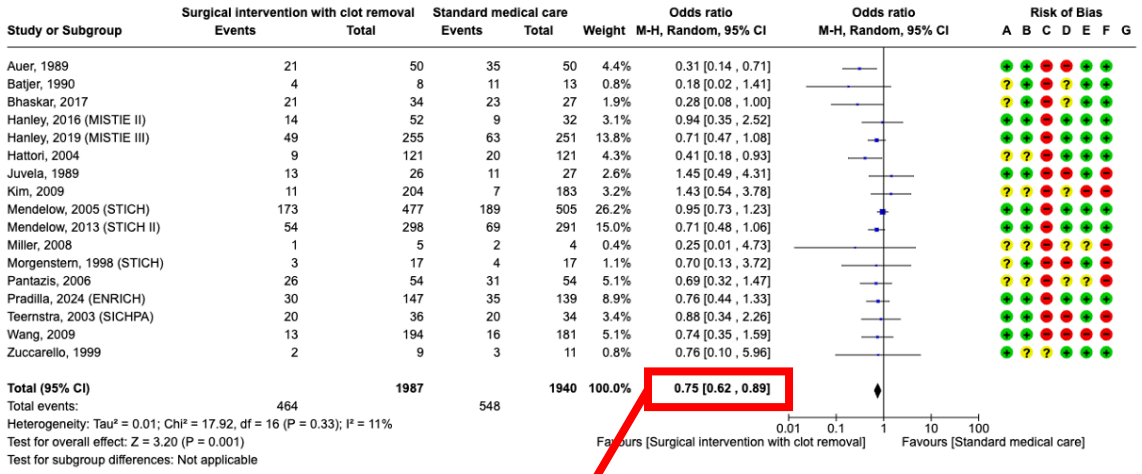
PICO 4.1.1:

In adult people with acute spontaneous **supratentorial** ICH, does **any surgery** aimed at clot removal versus no surgery reduce the risk of death or dependence?

Death at 3–12 months



Study or Subgroup	Surgical intervention with clot removal Events	Total	Standard medical care Events	Total	Weight	Odds ratio M-H, Random, 95% CI
Auer, 1989	21	50	35	50	4.4%	0.31 [0.14 , 0.71]
Batjer, 1990	4	8	11	13	0.8%	0.18 [0.02 , 1.41]
Bhaskar, 2017	21	34	23	27	1.9%	0.28 [0.08 , 1.00]
Hanley, 2016 (MISTIE II)	14	52	9	32	3.1%	0.94 [0.35 , 2.52]
Hanley, 2019 (MISTIE III)	49	255	63	251	13.8%	0.71 [0.47 , 1.08]
Hattori, 2004	9	121	20	121	4.3%	0.41 [0.18 , 0.93]
Juvela, 1989	13	26	11	27	2.6%	1.45 [0.49 , 4.31]
Kim, 2009	11	204	7	183	3.2%	1.43 [0.54 , 3.78]
Mendelow, 2005 (STICH)	173	477	189	505	26.2%	0.95 [0.73 , 1.23]
Mendelow, 2013 (STICH II)	54	298	69	291	15.0%	0.71 [0.48 , 1.06]
Miller, 2008	1	5	2	4	0.4%	0.25 [0.01 , 4.73]
Morgenstern, 1998 (STICH)	3	17	4	17	1.1%	0.70 [0.13 , 3.72]
Pantazis, 2006	26	54	31	54	5.1%	0.69 [0.32 , 1.47]
Pradilla, 2024 (ENRICH)	30	147	35	139	8.9%	0.76 [0.44 , 1.33]
Teernstra, 2003 (SICHPA)	20	36	20	34	3.4%	0.88 [0.34 , 2.26]
Wang, 2009	13	194	16	181	5.1%	0.74 [0.35 , 1.59]
Zuccarello, 1999	2	9	3	11	0.8%	0.76 [0.10 , 5.96]
Total (95% CI)		**1987**		**1940**	**100.0%**	**0.75 [0.62 , 0.89]**
Total events:	464		548			

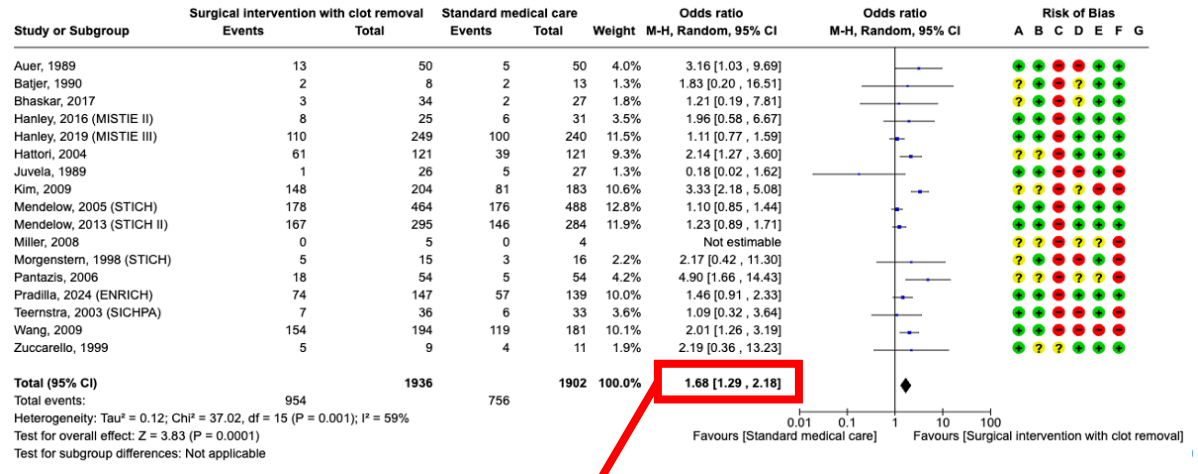
Heterogeneity: Tau² = 0.01; Chi² = 17.92, df = 16 (P = 0.33); I² = 11%
Test for overall effect: Z = 3.20 (P = 0.001)
Test for subgroup differences: Not applicable

Odds ratio M-H, Random, 95% CI
0.01 0.1 1 10 100
Favours [Surgical intervention with clot removal] Favours [Standard medical care]

Risk of Bias A B C D E F G

0.75 [0.62 , 0.89]

Good functional outcome (mRS 0-3) at 3–12 months



Study or Subgroup	Surgical intervention with clot removal Events	Total	Standard medical care Events	Total	Weight	Odds ratio M-H, Random, 95% CI
Auer, 1989	13	50	5	50	4.0%	3.16 [1.03 , 9.69]
Batjer, 1990	2	8	2	13	1.3%	1.83 [0.20 , 16.51]
Bhaskar, 2017	3	34	2	27	1.8%	1.21 [0.19 , 7.81]
Hanley, 2016 (MISTIE II)	8	25	6	31	3.5%	1.96 [0.58 , 6.67]
Hanley, 2019 (MISTIE III)	110	249	100	240	11.5%	1.11 [0.77 , 1.59]
Hattori, 2004	61	121	39	121	9.3%	2.14 [1.27 , 3.60]
Juvela, 1989	1	26	5	27	1.3%	0.18 [0.02 , 1.62]
Kim, 2009	148	204	81	183	10.6%	3.33 [2.18 , 5.08]
Mendelow, 2005 (STICH)	178	464	176	488	12.8%	1.10 [0.85 , 1.44]
Mendelow, 2013 (STICH II)	167	295	146	284	11.9%	1.23 [0.89 , 1.71]
Miller, 2008	0	5	0	4		Not estimable
Morgenstern, 1998 (STICH)	5	15	3	16	2.2%	2.17 [0.42 , 11.30]
Pantazis, 2006	18	54	5	54	4.2%	4.90 [1.66 , 14.43]
Pradilla, 2024 (ENRICH)	74	147	57	139	10.0%	1.46 [0.91 , 2.33]
Teernstra, 2003 (SICHPA)	7	36	6	33	3.6%	1.09 [0.32 , 3.64]
Wang, 2009	154	194	119	181	10.1%	2.01 [1.26 , 3.19]
Zuccarello, 1999	5	9	4	11	1.9%	2.19 [0.36 , 13.23]
Total (95% CI)		**1936**		**1902**	**100.0%**	**1.68 [1.29 , 2.18]**
Total events:	954		756			

Heterogeneity: Tau² = 0.12; Chi² = 37.02, df = 15 (P = 0.001); I² = 59%
Test for overall effect: Z = 3.83 (P = 0.0001)
Test for subgroup differences: Not applicable

Odds ratio M-H, Random, 95% CI
0.01 0.1 1 10 100
Favours [Standard medical care] Favours [Surgical intervention with clot removal]

Risk of Bias A B C D E F G

1.68 [1.29 , 2.18]

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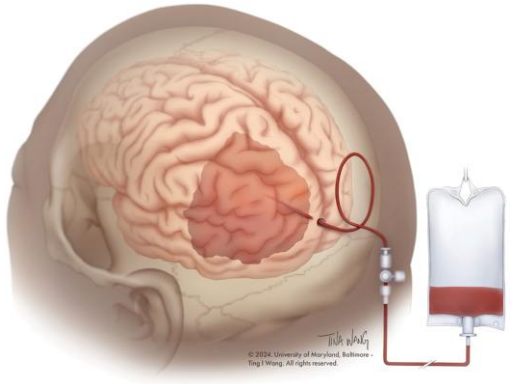
PICO 4.1.2 to 4.1.4:

Which type of surgery aimed at clot removal?

Supratentorial ICH

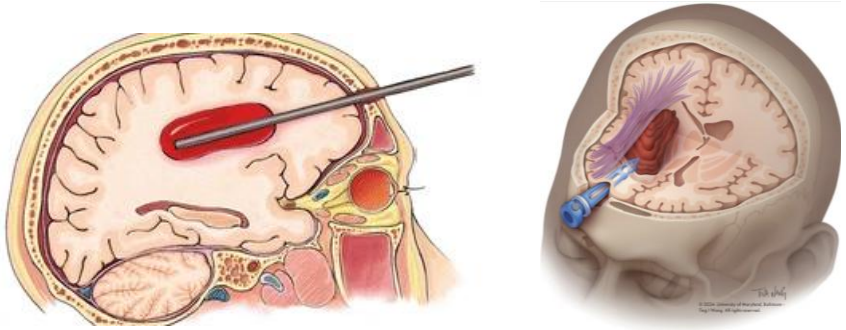
Craniotomy

PICO 4.1.2



Stereotactic aspiration with clot lysis

PICO 4.1.3



Minimally-invasive surgery

PICO 4.4.4

Hersh e.a. Curr Neurol Neurosci Rep 2018; 18(6): 34
Morris e.a. Neurology 2024; 103(4): e209714
Colmer e.a. Tijdschr Neurol Neurochirg 2024;125(6): 47-255

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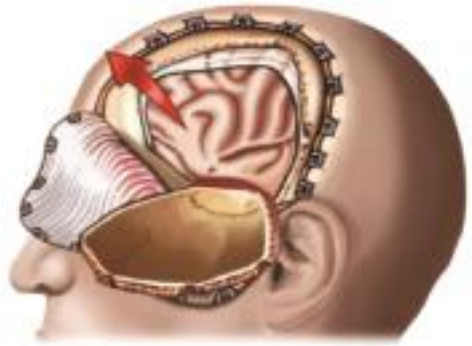
PICO 4.1.2:

In adults with acute spontaneous **supratentorial ICH**, does any haematoma removal by means of **craniotomy and open standard surgical technique** versus no surgery reduce the risk of death, or dependence?



Evidence-based Recommendation
In non-comatose adults with acute spontaneous supratentorial lobar ICH where minimally invasive approaches are not available (see PICO 4.1.3), we suggest consideration of early surgical haematoma removal by means of open craniotomy and a standard surgical evacuation technique.
Quality of evidence: Very low ⊕
Strength of recommendation: Weak for intervention ↑?

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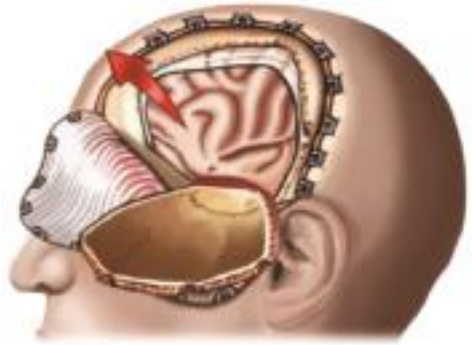
PICO 4.1.2:

In adults with acute spontaneous **supratentorial ICH**, does any haematoma removal by means of **craniotomy and open standard surgical technique** versus no surgery reduce the risk of death, or dependence?



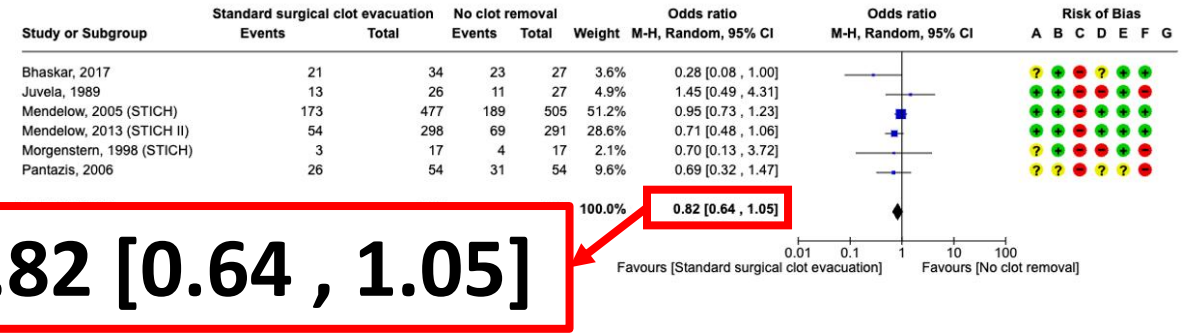
Evidence-based Recommendation

In non-comatose adults with acute spontaneous supratentorial lobar ICH where minimally invasive approaches are not available (see PICO 4.1.3), we suggest consideration of early surgical haematoma removal by means of open craniotomy and a standard surgical evacuation technique.

Quality of evidence: Very low ⊕

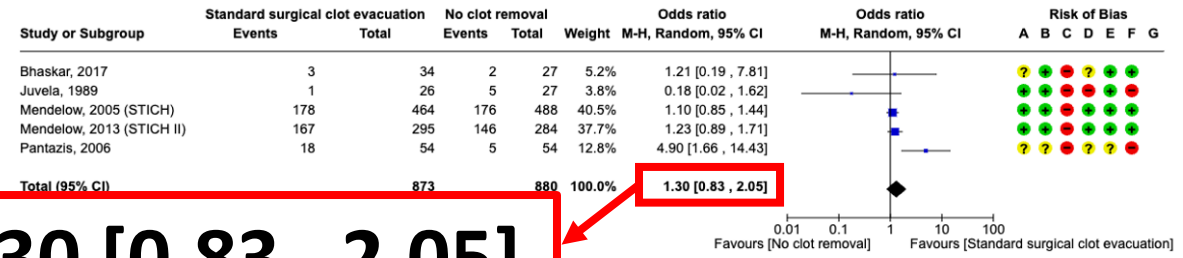
Strength of recommendation: Weak for intervention ↑?

Death at 3–12 months



0.82 [0.64 , 1.05]

Good functional outcome (mRS 0-3) at 3–12 months



1.30 [0.83 , 2.05]

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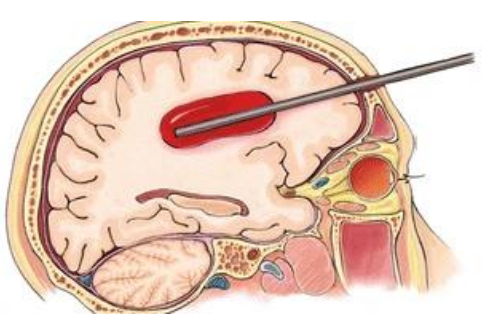
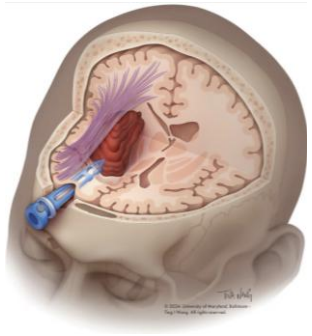
PICO 4.1.3:

In adults with acute spontaneous **supratentorial** ICH, does minimally invasive surgical removal (**MIS**) of the haematoma versus no surgery reduce the risk of death or dependence?





Evidence-based Recommendation

In adults with spontaneous supratentorial lobar ICH onset, we suggest minimally invasive evacuation of the haematoma within 24 hours of onset of the ICH to reduce mortality and to improve functional outcome, whereas the effect in deep haematomas remains uncertain, so we encourage recruitment to ongoing randomised controlled trials.

Quality of evidence: Low ⊕⊕

Strength of recommendation: Weak for intervention ↑?

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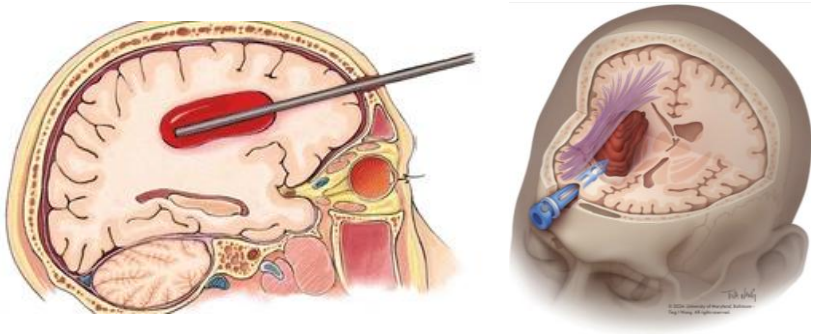
PICO 4.1.3:

In adults with acute spontaneous **supratentorial** ICH, does minimally invasive surgical removal (**MIS**) of the haematoma versus no surgery reduce the risk of death or dependence?



Evidence-based Recommendation

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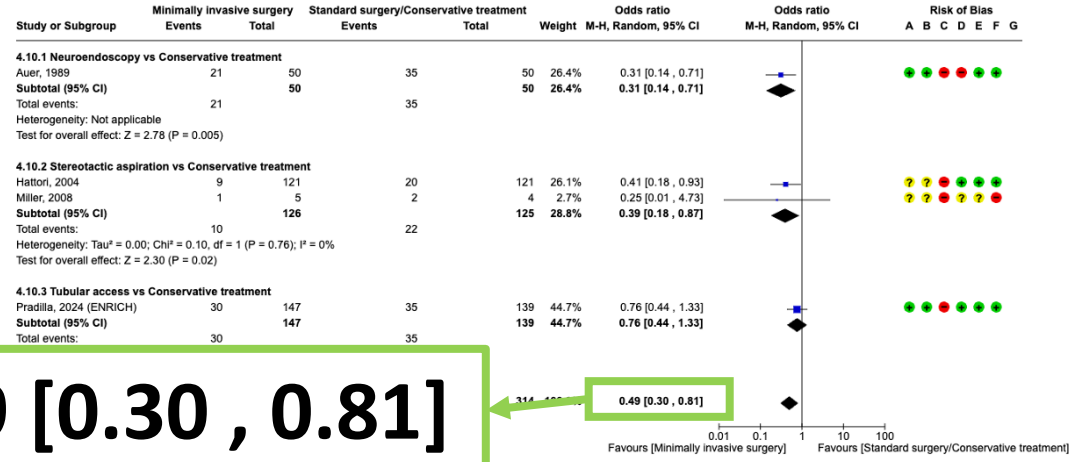
Quality of evidence: Low ⊕⊕

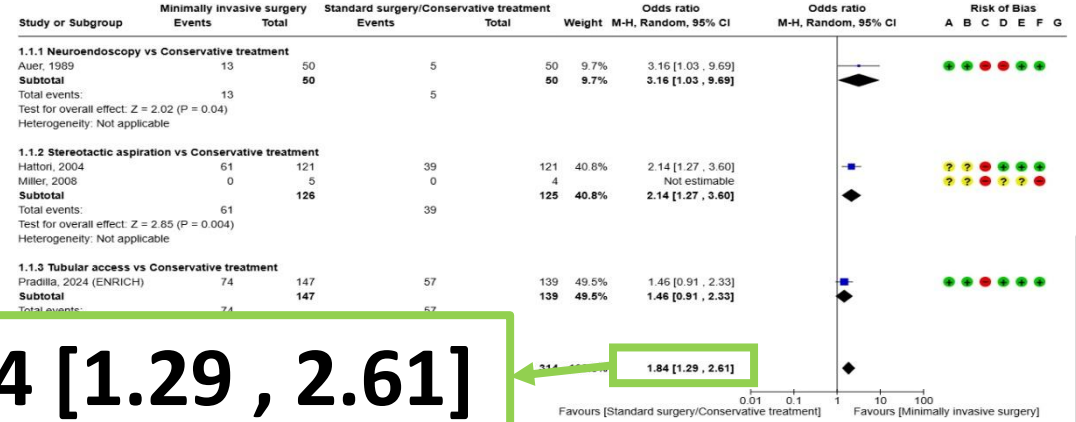
Strength of recommendation: Weak for intervention ↑?

Death at 3–12 months



0.49 [0.30 , 0.81]

Good functional outcome (mRS 0-3) at 3–6 months



1.84 [1.29 , 2.61]

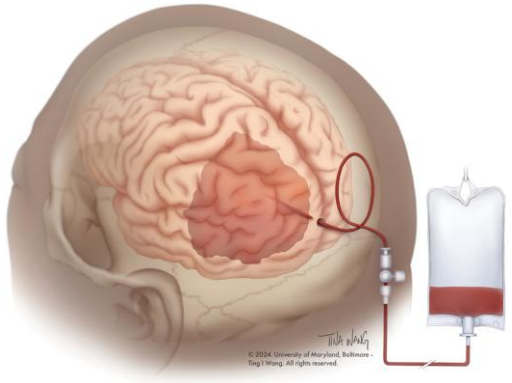
Footnotes

[a]CI calculated by Wald-type method.

[b]Tau² calculated by DerSimonian and Laird method.

PICO 4.1.4:

In adults with acute spontaneous **supratentorial** ICH, does surgery with **catheter** placement **plus thrombolysis** versus no surgery reduce the risk of death or dependence?



Evidence-based Recommendation
In adults with spontaneous supratentorial ICH, there is uncertainty about surgery with catheter placement plus thrombolysis over medical management alone, so we recommend recruitment to randomised controlled trials.
Quality of evidence: Very low ⊕
Strength of recommendation: -

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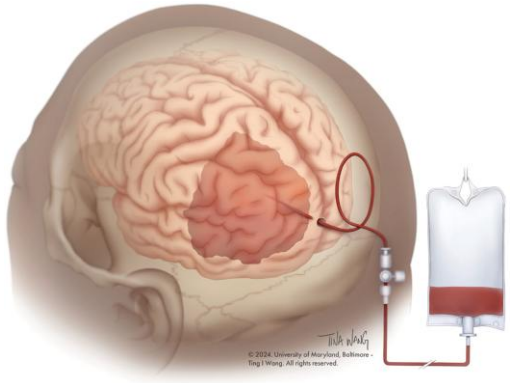
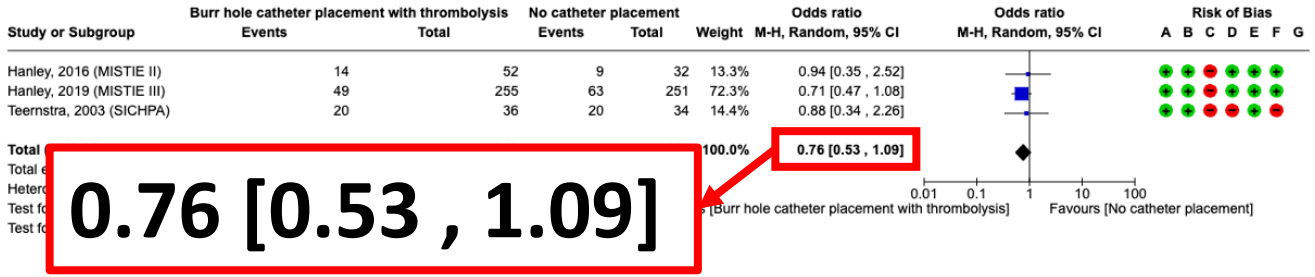
PICO 4.1.4:

In adults with acute spontaneous **supratentorial** ICH, does surgery with **catheter** placement **plus thrombolysis** versus no surgery reduce the risk of death or dependence?



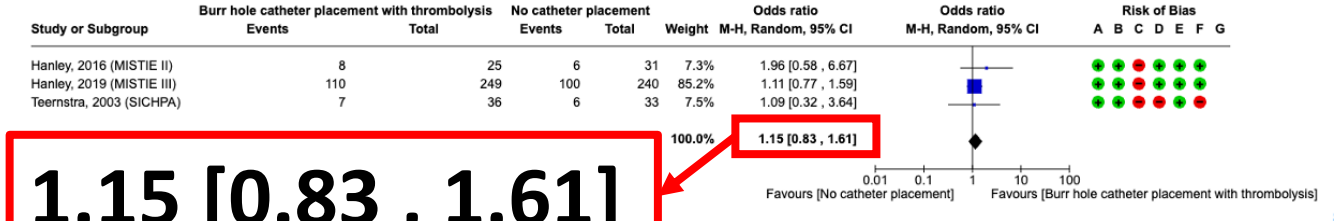
Evidence-based Recommendation
In adults with spontaneous supratentorial ICH, there is uncertainty about surgery with catheter placement plus thrombolysis over medical management alone, so we recommend recruitment to randomised controlled trials.
Quality of evidence: Very low ⊕
Strength of recommendation: -

Death at 3–12 months



0.76 [0.53 , 1.09]

Good functional outcome (mRS 0-3) at 3–12 months



1.15 [0.83 , 1.61]

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PICO 4.1.5:

In adults with acute spontaneous **supratentorial** ICH, does **decompressive craniectomy** compared with no decompressive craniectomy reduce the risk of death, or dependence?

Decompressive craniectomy

Evidence-based Recommendation
In adults aged 18–75 years within 72 h of severe deep spontaneous ICH (i.e. GCS 8–13, NIHSS 10–30 and stable ICH volume 30–100 mL), we suggest consideration of decompressive surgery without haematoma removal to reduce the risk of death, or severe dependence (mRS 5–6).
Quality of evidence: Low ⊕⊕
Strength of recommendation: Weak for intervention ↑?

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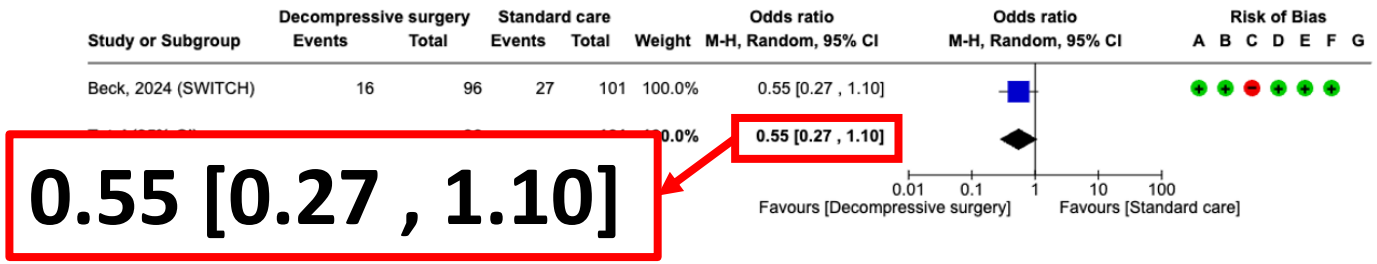
PICO 4.1.5:

In adults with acute spontaneous **supratentorial** ICH, does **decompressive craniectomy** compared with no decompressive craniectomy reduce the risk of death, or dependence?

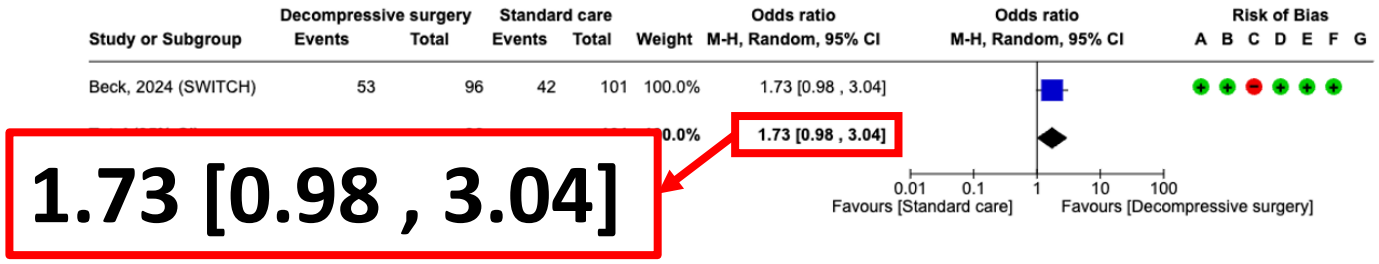
Decompressive craniectomy

Evidence-based Recommendation
In adults aged 18–75 years within 72 h of severe deep spontaneous ICH (i.e. GCS 8–13, NIHSS 10–30 and stable ICH volume 30–100 mL), we suggest consideration of decompressive surgery without haematoma removal to reduce the risk of death, or severe dependence (mRS 5–6).
Quality of evidence: Low ⊕⊕
Strength of recommendation: Weak for intervention ↑?

Death at 6 months



Good functional outcome (mRS 0-4) at 6 months



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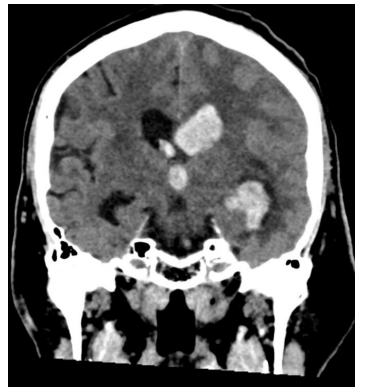
Intraventricular extension of ICH



PICO 4.2.1:

In adults with IVH, does **external ventricular drainage** (**EVD**) **with or without** combined **lumbar** drainage (**LD**) reduce the risk of death or dependence, or shunt dependence?

No RCT data available

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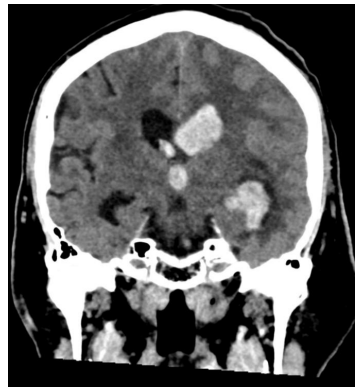
Intraventricular extension of ICH



PICO 4.2.1:

In adults with IVH, does **external ventricular drainage** (**EVD**) **with or without** combined **lumbar** drainage (**LD**) reduce the risk of death or dependence, or shunt dependence?

No RCT data available

Evidence-based Recommendation
In adults with spontaneous ICH and intraventricular extension of the haemorrhage there is uncertainty about the balance of beneficial and adverse effects of external ventricular drainage (EVD) with or without combined lumbar drainage (LD) on the risk of death, or dependence, or shunt dependence, so we recommend recruitment to randomised controlled trials.
Quality of evidence: Very low ⊕
Strength of recommendation: -

Expert consensus statement
In adults with ICH, intraventricular extension of the haemorrhage and hydrocephalus contributing to an impaired level of consciousness, we suggest inserting an external ventricular drainage (EVD) to reduce mortality.
Vote: 15/15

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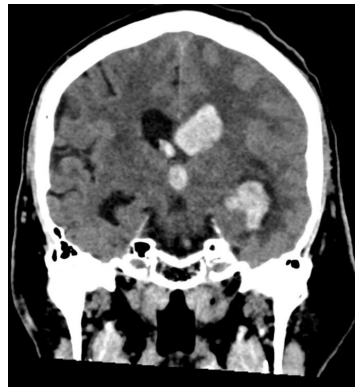
Intraventricular extension of ICH



PICO 4.2.2:

In adults with IVH, does external ventricular drainage (**EVD**) **with intraventricular thrombolysis** versus EVD without intraventricular thrombolysis reduce the risk of death, or dependence, or shunt dependence?

Evidence-based Recommendation

In adults with acute spontaneous ICH and intraventricular extension, we suggest considering external ventricular drainage (EVD) with intraventricular thrombolysis to reduce death, though there is uncertainty about the balance of beneficial and adverse effects regarding dependence, and shunt dependence.

Quality of evidence: Very low ⊕

Strength of recommendation: Weak for intervention ↑?

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Intraventricular extension of ICH

PICO 4.2.2:

In adults with IVH, does external ventricular drainage (**EVD**) **with intraventricular thrombolysis** versus EVD without intraventricular thrombolysis reduce the risk of death, or dependence, or shunt dependence?

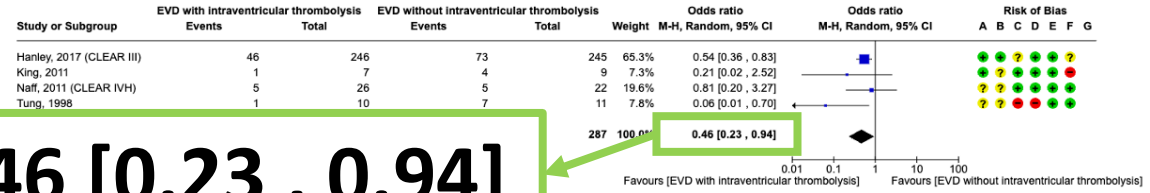
Evidence-based Recommendation

In adults with acute spontaneous ICH and intraventricular extension, we suggest considering external ventricular drainage (EVD) with intraventricular thrombolysis to reduce death, though there is uncertainty about the balance of beneficial and adverse effects regarding dependence, and shunt dependence.

Quality of evidence: Very low ⊕

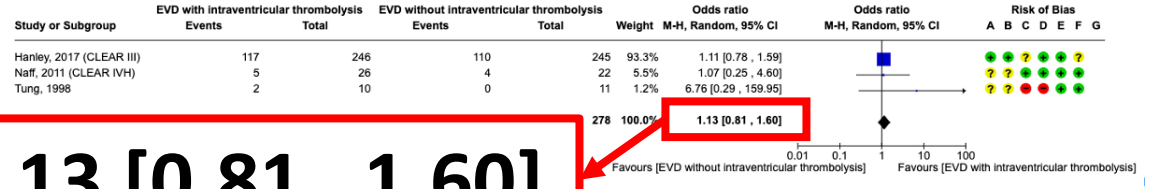
Strength of recommendation: Weak for intervention ↑?

Death at 6 months



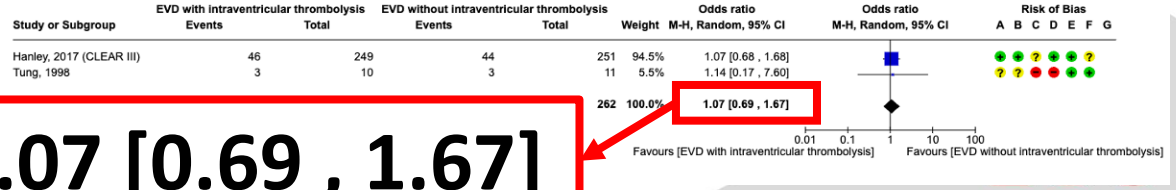
0.46 [0.23 , 0.94]

Good functional outcome (mRS 0-3) at 6 months



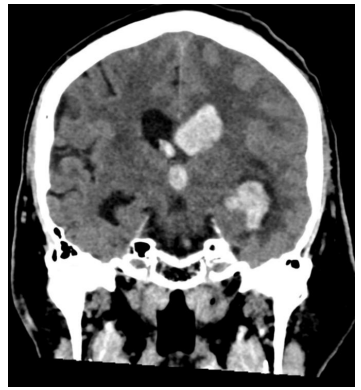
1.13 [0.81 , 1.60]

Shunt dependence



1.07 [0.69 , 1.67]

Intraventricular extension of ICH



PICO 4.2.3:

In adults with IVH, does **surgical removal** of the intraventricular blood reduce the risk of death, or dependence, or shunt dependence?

Evidence-based Recommendation

In adults with intraventricular extension of the ICH who require an external ventricular drainage (EVD), we suggest minimally invasive surgical evacuation of intraventricular blood to improve functional outcome and reduce shunt dependence.

Quality of evidence: Very low ⊕

Strength of recommendation: Weak for intervention ↑?

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Intraventricular extension of ICH

PICO 4.2.3:

In adults with IVH, does **surgical removal** of the intraventricular blood reduce the risk of death, or dependence, or shunt dependence?

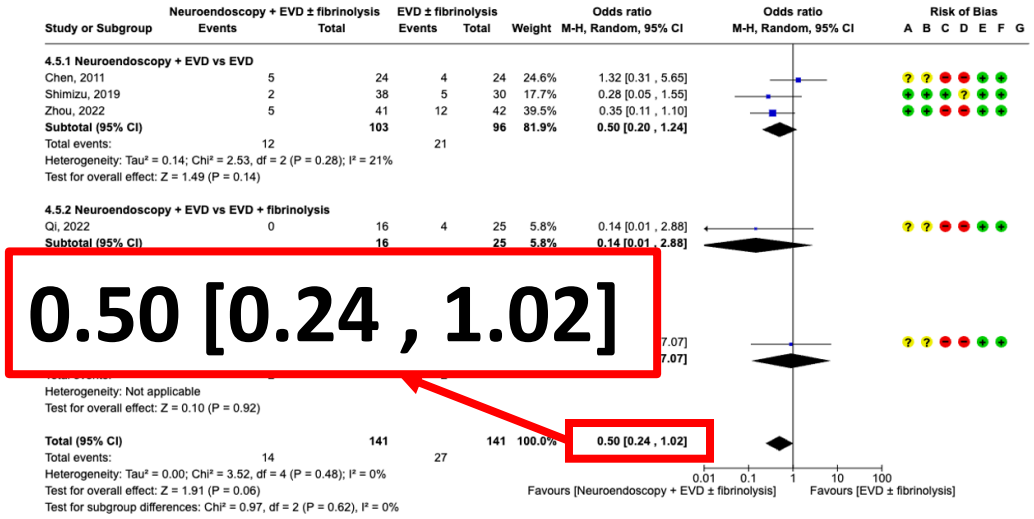
Evidence-based Recommendation

In adults with intraventricular extension of the ICH who require an external ventricular drainage (EVD), we suggest minimally invasive surgical evacuation of intraventricular blood to improve functional outcome and reduce shunt dependence.

Quality of evidence: Very low ⊕

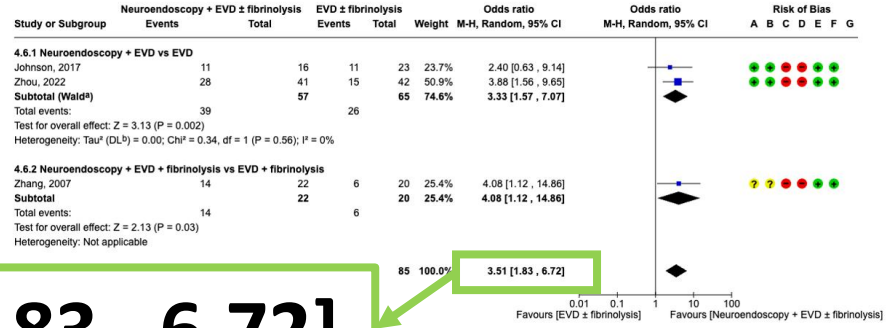
Strength of recommendation: Weak for intervention ↑?

Death at 1-6 months



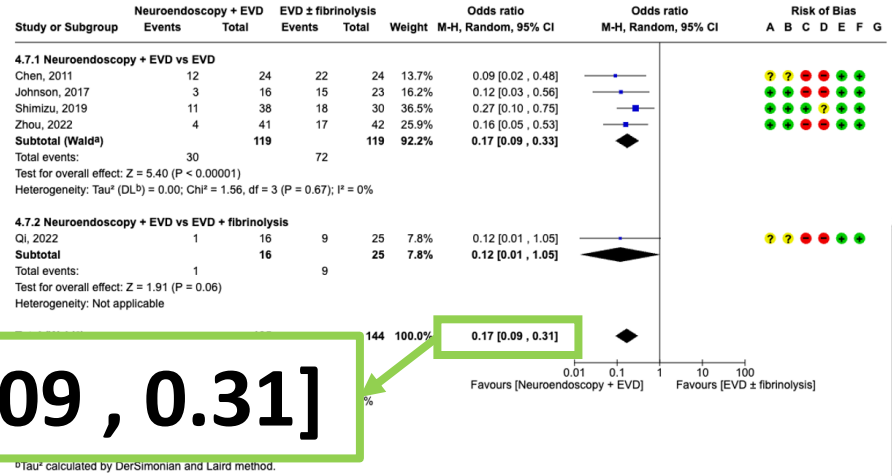
0.50 [0.24 , 1.02]

Good functional outcome (mRS 0-3) at 6 months



3.51 [1.83 , 6.72]

Shunt dependence



0.17 [0.09 , 0.31]

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Infratentorial ICH

PICO 4.3:

In adults with acute cerebellar haemorrhage, does surgery compared with medical management reduce the risk of death, or dependence?

No RCT data available

Infratentorial ICH

PICO 4.3:

In adults with acute cerebellar haemorrhage, does surgery compared with medical management reduce the risk of death, or dependence?

No RCT data available

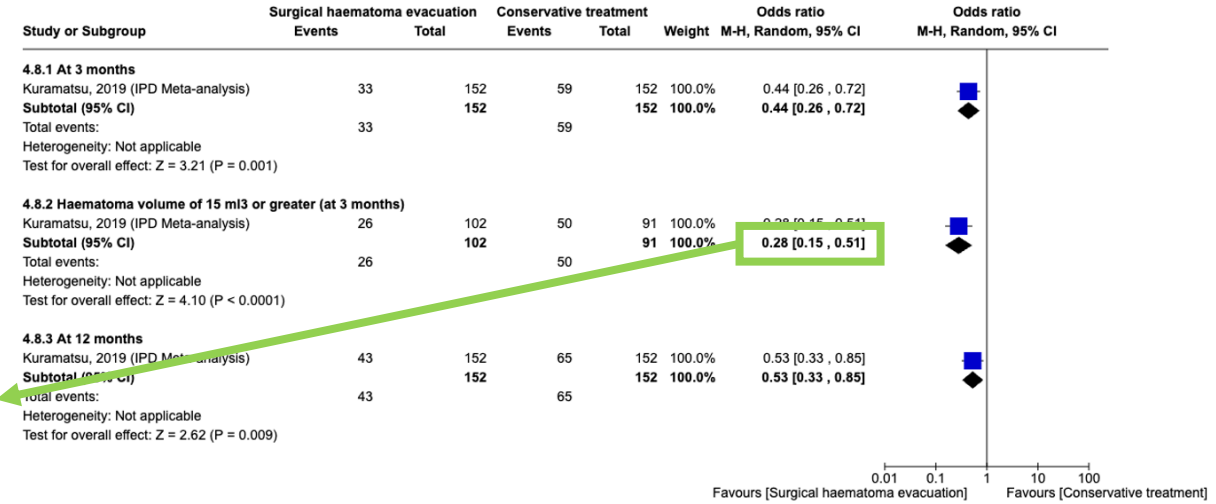
Evidence-based Recommendation

In adults with acute cerebellar haemorrhage, we suggest surgical evacuation of haematomas larger than 15 mL to improve survival.

Quality of evidence: Very low ⊕

Strength of recommendation: Weak for intervention ↑?

Death at 3 and 12 months



0.28 [0.15 , 0.51]

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Evidence-based Recommendations

Supratentorial ICH

PICO 4.1.1:

In adult people with acute spontaneous **supratentorial** ICH, does **any surgery** aimed at clot removal versus no surgery reduce the risk of death or dependence?

Evidence-based Recommendation

In adults with acute spontaneous supratentorial ICH, we suggest for a surgical approach aiming at haematoma removal and prevention of secondary brain injury to reduce the risk of death, or dependence, taking into account additional factors such as **haematoma location and volume, the patient's neurological condition, timing, method of intervention**, and the surgeon's complication rate.

Quality of evidence: Very low ⊕
Strength of recommendation: Weak for intervention ↑?

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Evidence-based Recommendations

Supratentorial ICH

- Lobar hematomas
- Around 20 – 100 cc hematoma volume
- In patients with a GCS of (6) 8 – 13 (14)
- Early - in less than 24 hours
- Prefer minimal invasive techniques - minimal invasive neurosurgical mindset
- Take part in trials

Conclusions surgical management

Supratentorial ICH

- Consider surgical haemotoma removal by availability of technique, favouring MIS
- Consider decompressive surgery in severe, deep ICH

Intraventricular extension

- Consider EVD with intraventricular thrombolysis or surgical removal

Infratentorial ICH

- Consider evacuation of cerebellar ICH > 15mL

Areas of future research

How to operate

- Which technique?
- Which end-of-treatment target?

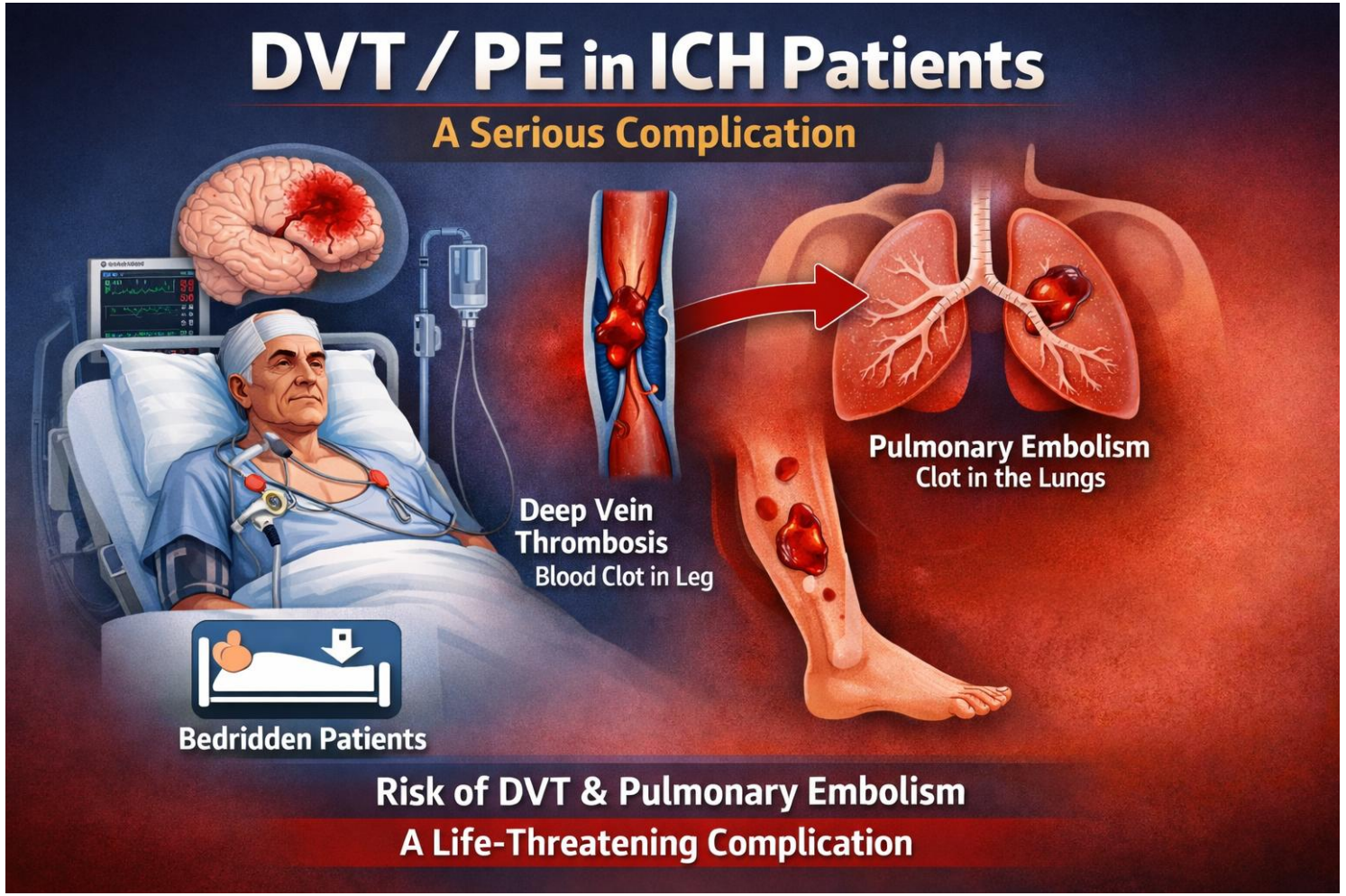
Whom to operate

- Patient characteristics (age, GCS, …)?
- Haematoma characteristics (location, volume, …)?

When to operate

- <8h, <24h, <72h, …?

Prevention of complications



Jan Purrucker
Germany

Bedridden,
immobile patients

c/v comorbidities

Need for
“hemostasis”

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Prevention of complications | DVT and PE

PICO 5.1.1 In adults with spontaneous ICH, do **physical measures** to **prevent** deep vein thrombosis (**DVT**) or pulmonary embolism (**PE**) reduce venous thromboembolism, symptomatic pulmonary embolism/DVT, or death compared with standard care?

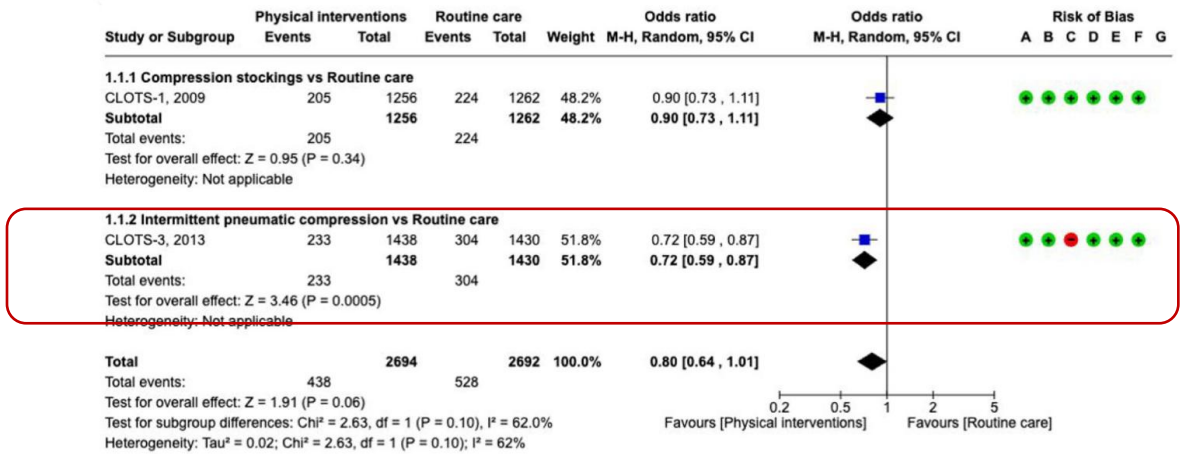

Figure 50. Prevention of **deep venous thrombosis** by physical interventions versus routine care (follow-up: 30 days).

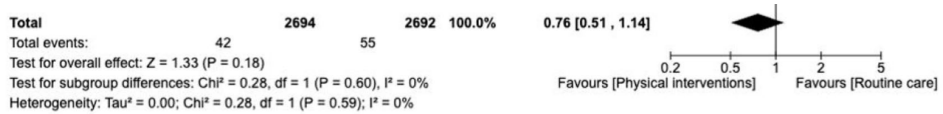

Figure 51. Prevention of **pulmonary embolism** by physical interventions versus routine care (follow-up: 30 days).

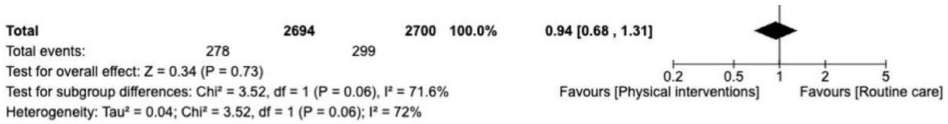

Figure 52. Prevention of **death** by physical interventions versus routine care (follow-up: 30 days).

Lancet **382**, 516–524 (2013).

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Prevention of complications | DVT and PE

PICO 5.1.1 In adults with spontaneous ICH, do **physical measures** to **prevent** deep vein thrombosis (**DVT**) or pulmonary embolism (**PE**) reduce venous thromboembolism, symptomatic pulmonary embolism/DVT, or death compared with standard care?

Evidence-based Recommendation
In immobile adults with spontaneous ICH, we suggest for intermittent pneumatic compression stockings for 30 days (or hospital discharge or independent ambulation, if sooner) to prevent proximal deep vein thrombosis. Continued uncertainty exists whether **intermittent pneumatic compression** (IPC) reduces symptomatic pulmonary embolism and death.

Quality of evidence: Very low ⊕
Strength of recommendation: Weak for intervention ↑?

Prevention of complications | DVT and PE

PICO 5.1.2 In adults with spontaneous ICH does **short-term anti-thrombotic therapy** to prevent deep vein thrombosis (DVT) and/or pulmonary embolism (PE) vs. standard care reduce (symptomatic) venous thromboembolism, symptomatic pulmonary embolism, or death without increasing the risk of recurrent ICH?

Evidence-based Recommendation
In adults with spontaneous ICH, there is uncertainty whether subcutaneous low-molecular-weight heparins (LMWH) at prophylactic doses starting as early as 24 hours after ICH onset and established stability of the ICH prevent venous thromboembolism, symptomatic deep vein thrombosis (DVT), pulmonary embolism (PE), or death, without increasing the risk of recurrent ICH, so we recommend recruitment to randomised controlled trials.

Quality of evidence: Very low ⊕
Strength of recommendation: -

Expert consensus statement:
Low-molecular-weight heparins (LMWH) prophylaxis after ICH might be used for venous thromboembolism prevention in standard clinical practice if intermittent pneumatic compression is not available or feasible. The use should be limited to immobile patients, as well as patients at high prothrombotic risk (due to comorbidities, or prothrombotic medications).

Vote: 15 / 15

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Intracranial Pressure Measurement

Prevention and Management of complications | ICP

PICO 5.1.5 In adults with spontaneous ICH, does **intracranial pressure (ICP)** monitoring vs. no monitoring of ICP reduce the risk of death or dependence?

- 1 RCT, single-centre
- N=90 ICH caused by hypertensive microangiopathy
- Intervention: ICP measurement (intraventricular ICP-sensing probe)
- Comparator: conventional EVD
- Primary outcome: composite of incidence rate of HE and brain herniation
- Results:
  - Occurrence of primary outcome: 33% (ICP-monitoring) vs. 39% (without), p=0.76
  - Brain herniation: 11% vs. 21%, p=0.04
  - Death rate at 6-months: 6.5% vs. 9.1%, p=0.04

Zeng, J *BMC Anesthesiol.* **14**, 19 (2014).

Prevention and Management of complications | ICP

PICO 5.1.5 In adults with spontaneous ICH, does **intracranial pressure (ICP)** monitoring vs. no monitoring of ICP reduce the risk of death or dependence?

Evidence-based Recommendation
In adults with severe acute spontaneous space-occupying ICH, there is uncertainty about the use of invasive intracranial pressure (ICP) monitoring for reducing death or dependence, so we recommend recruitment to randomised controlled trials.

Quality of evidence: Low ⨁⨁
Strength of recommendation: -

Expert consensus statement
In adults with severe acute spontaneous space-occupying ICH, and if clinical symptom monitoring alone is not feasible, the use of invasive intracranial pressure (ICP) monitoring may be considered, preferably using intraventricular measurements with the additional option of cerebral spinal fluid (CSF) drainage.
Vote: 15 / 15

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Anti-inflammatory treatment

PICO 5.1.6 In adults with spontaneous ICH, does **anti-inflammatory treatment** vs. no anti-inflammatory treatment reduce the risk of death or dependence and formation of perihaematomal oedema?

Substance	No of RCTs	Enrolled patients (total)
Anakinra	1 RCT	25
Celecoxib	1 RCT	44
Citicoline	1 RCT	38
Corticosteroids	6 RCTs	429
Deferoxamine	2 RCTs	333
Edaravone	38 RCTs (China)	3454
Fingolimod	1 RCT	23
Minocycline	2 RCTs	36
Panax notoginseng	No official RCTs	
Reactive oxygen species scavangers	1 RCT	123

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PICO 5.1.6 In adults with spontaneous ICH, does **anti-inflammatory treatment** (celecoxib, citicoline, corticosteroids, edaravone, fingolimod, minocycline, panax notoginseng, or reactive oxygen species scavangers) vs. no anti-inflammatory treatment reduce the risk of death or dependence and formation of perihaematomal oedema?

Evidence-based Recommendation

In adults with acute spontaneous ICH, we recommend against using anti-inflammatory interventions (in particular, anakinra, celecoxib, citicoline, corticosteroids, deferoxamine, edaravone, fingolimod, minocycline, panax notoginseng, or reactive oxygen species scavengers) to reduce death, morbidity or perihaematomal oedema, outside of randomised controlled trials.

Quality of evidence: Very low ⊕

Strength of recommendation: Strong against intervention ↓↓

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Anti-seizure medication

Prevention and Management of complications | Seizures

PICO 5.1.7 In adults with spontaneous ICH, does prophylactic treatment with **anti-seizure medications** compared with no anti-seizure treatment prevent acute / remote symptomatic epileptic seizures?

Evidence-based Recommendation
In adults with spontaneous ICH, we suggest against treatment with anti-seizure medications for the **primary prevention** of acute / remote symptomatic epileptic seizures

Quality of evidence: Moderate ⊕⊕⊕
Strength of recommendation: **Weak against** intervention ↓?

In adults with spontaneous supratentorial ICH and **symptomatic seizure within 7 days** after onset, we cannot make a recommendation about the use of anti-seizure medications because there is continued **uncertainty** about their effects.

Quality of evidence: Very low ⊕
Strength of recommendation: -

Expert consensus statement
In adults with spontaneous ICH, in whom **anti-seizure medication was initiated after symptomatic seizure(s)** during the first seven days after ICH onset, and in whom **no further seizures occur**, we suggest anti-seizure treatment to be **discontinued from four weeks** onwards.

Vote: 15 /15

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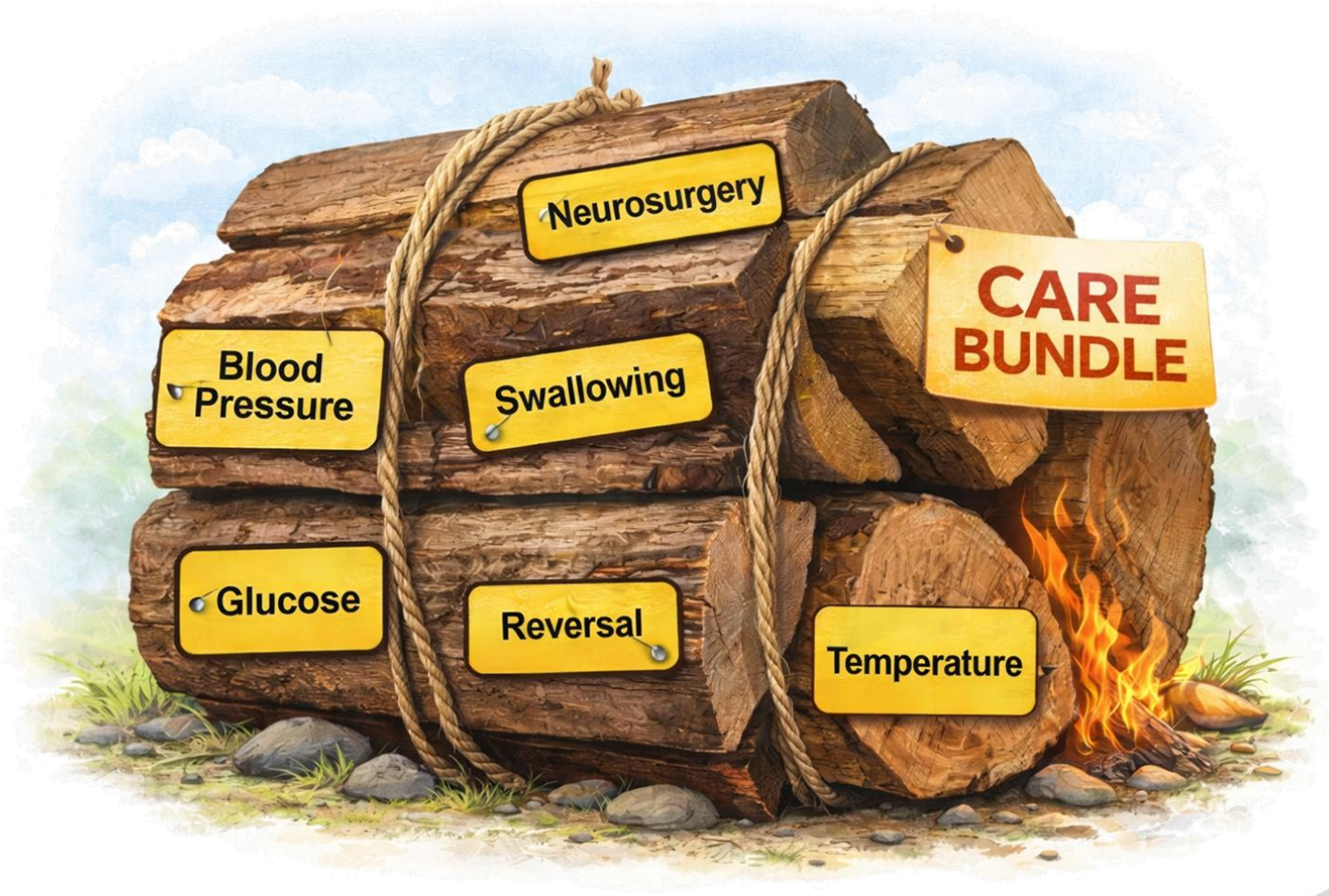
Combining approaches: care bundles



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Prevention and Management of complications | Care Bundles

PICO 5.2 In adults with spontaneous ICH, does applying a specific **care bundle** compared with usual care reduce mortality or dependence?

Care bundle trials (treatment, not "prevention")

	QASC (2011; AIS + ICH < 48 h)	INTERACT-3 (2023) (ICH < 6 h)
Fever	Monitoring for 72 h; PCM if T ≥ 37.5°C	Target ≤ 37.5°C within 1h of initiation
Sugar	1xvenous blood test+finger-prick every 1-6 h for 72 h Glc 8–11 mmol/l (diabetic) or 8–16 (non-diabetic): start *saline infusion* for 6 h If Glc ≥ 11 mmol(diab) or ≥ 16 (non-diab), start *insulin infusion*	Target 7.8–10 mmol/l (diabetic) 6.1–7.8 (non-diab)
Dysphagia	education program, ASSIST tool screening -> failure to pass -> speech pathologist	
BP	-	Target < 140 mmHg SBP within 1h, cessation if < 130 mmHg
Anticoagulation	-	Rapid reversal (VKA: FFP or PCC), Goal: INR 1.5 within 1h

72 h

7 d

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Prevention and Management of complications | Care Bundles

PICO 5.2 In adults with spontaneous ICH, does applying a specific **care bundle** compared with usual care reduce mortality or dependence?

Care bundle study (pre/post intervention)

	Parry-Jones (2019)
Fever	-
Sugar	-
Dysphagia	-
BP	Target SBP 130–140 mmHg (ICH < 6 h and SBP > 150)
Anticoagulation	PCC (VKA o FXa-in.) or Idarucizumab ≤ 90 min
Neurosurgery	Immediate referral to neurosurgeon (if pmRS ≤ 2 and GCS < 9, posterior fossa ICH, obstr. 3rd/4th ventricle/or hematoma volume > 30 ml)

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Prevention and Management of complications | Care Bundles

PICO 5.2 In adults with spontaneous ICH, does applying a specific **care bundle** compared with usual care reduce mortality or dependence?

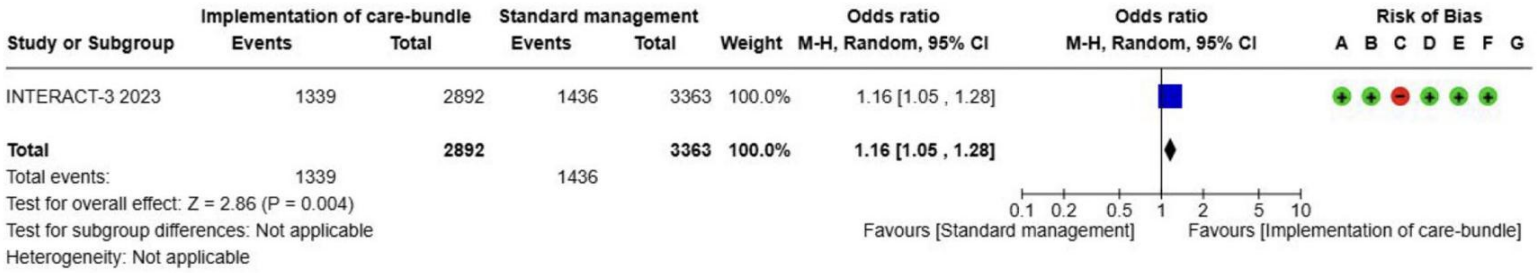

Figure 62. Effects on **good functional outcome** (mRS 0–2) of an implementation of a care-bundle versus standard management (follow-up: range 3–6 months).

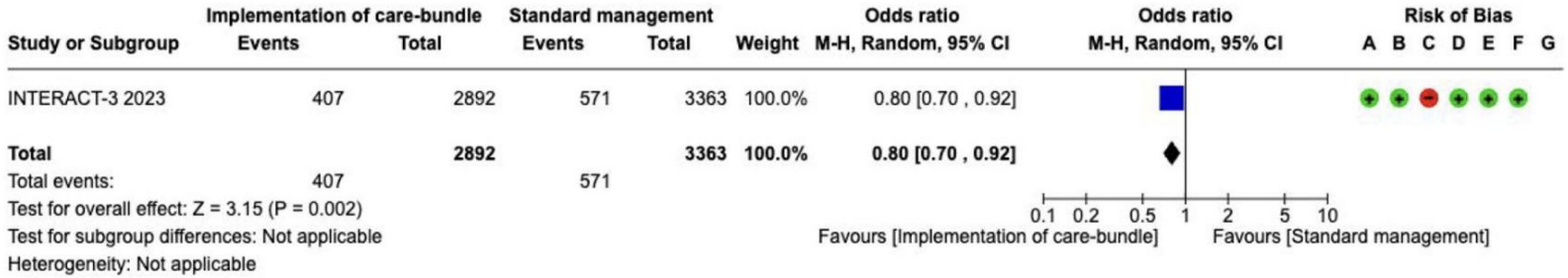

Figure 63. Effects on **deaths** of an implementation of a care-bundle versus standard management (follow-up: range 30 days–6 months).

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Prevention and Management of complications | Care Bundles

Evidence-based Recommendation

In adults with acute spontaneous ICH, we suggest implementing a care bundle to reduce death or dependence (see Expert Consensus Statement for details and targets).

Quality of evidence: Low ⨁⨁

Strength of recommendation: Weak for intervention ↑?

We suggest against the prophylactic use of temperature lowering measures, prokinetic anti-emetics and/or antibiotics.

Quality of evidence: Low ⨁⨁

Strength of recommendation: Weak against intervention ↓?

PICO 5.2 In adults with spontaneous ICH, does applying a specific **care bundle** compared with usual care reduce mortality or dependence?

Expert consensus statement:

1. We recommend implementing the components of the care bundle influencing our recommendation, which were:
2. **early intensive blood pressure management** with the goal of achieving a target systolic blood pressure of less than 140 mmHg in minor to moderate ICH within 1 h of the initiation of treatment (see also PICO 2 for details);
3. **control of elevated blood glucose** (target 110–141 mg/dL [6.1–7.8 mmol/L] without diabetes/141–180 mg/dL [7.8–10 mmol/L] with diabetes; avoiding hypoglycaemia) as soon as possible after the initiation of treatment;
4. **treatment of pyrexia** with the goal of achieving a body temperature of less than 37.5°C within 1 h of initiation; and
5. the **reversal of abnormal anticoagulation** in those taking vitamin K-antagonists using prothrombin concentrate complex with the goal of reaching an INR of less than 1.3 within 1 h of treatment (see PICO 3.3.1.1 for details), and application of specific reversal agents to patients receiving direct oral anticoagulants (see PICOs 3.3.2.1 to 3.3.2.4 for details).

We suggest **additional components** of other care bundles that may be beneficial:

- **avoiding do-not-resuscitate orders** within the first 24 hours after admission unless there is a clear will of the patient
- application of routine **dysphagia screening and treatment**
- **early consulting of a neurosurgeon** to evaluate surgical measures in patients such as with large spontaneous ICH, intraventricular bleeding, or space-occupying infratentorial haemorrhage.

We recommend inclusion of patients in **randomised trials of bundles of care**.

Vote: 15 / 15

AI Gen. Symbolic.

PICO 5.2

Refer to the ESO Guideline publication by Steiner et al. Eur Stroke J. 2025;10:1007–1086

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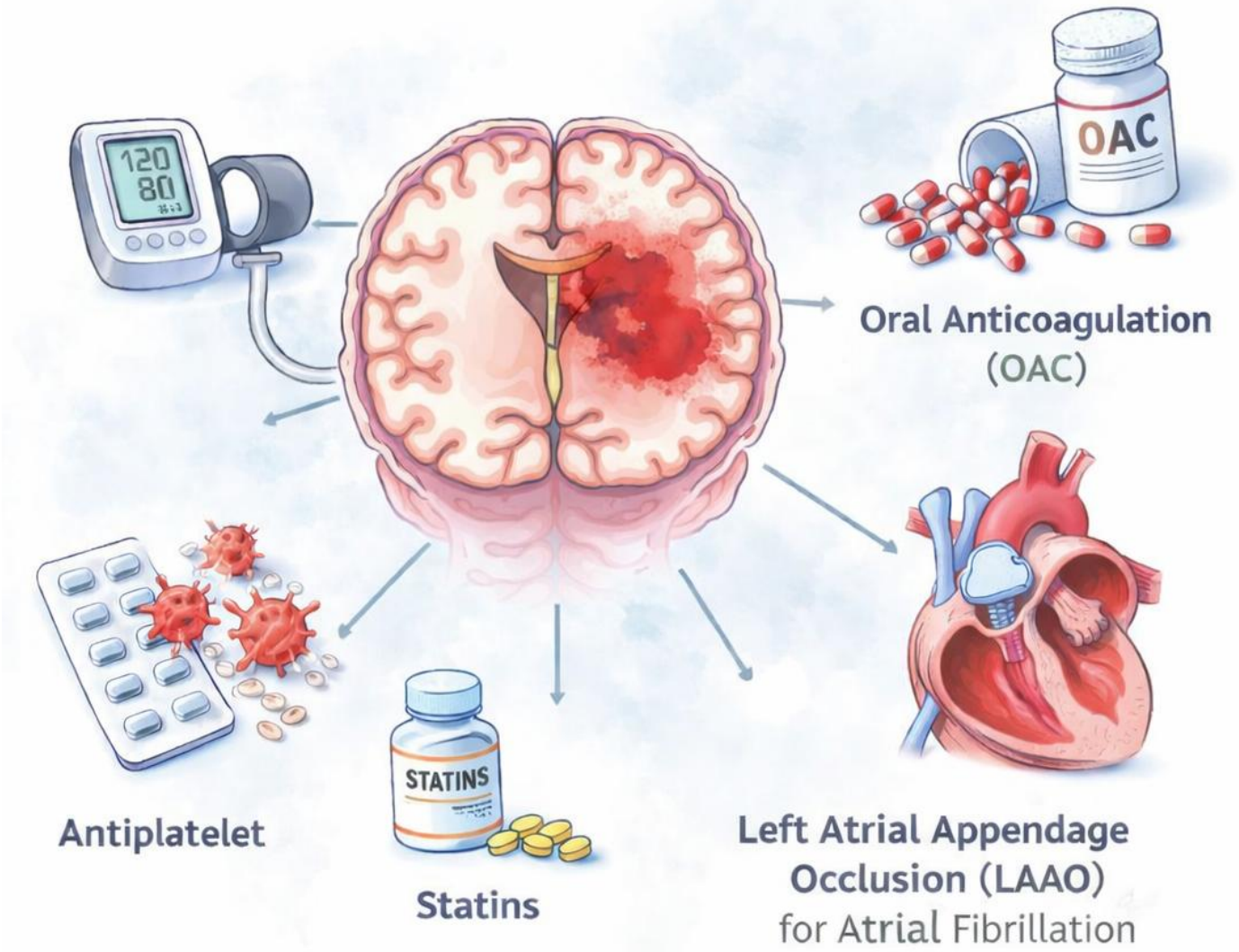
06 Secondary prevention

Jesper Petersson
Sweden



06 Secondary prevention
1. Blood Pressure

Evidence-based recommendation:

Blood pressure control to reduce risk of stroke

Quality of evidence: Low ⊕⊕
Strength of recommendation: Strong for intervention ↑↑

Expert recommendation:

⩽130/80 mmHg by using a combination of antihypertensive drugs (ERICH, ESC, SPS3)

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06 Secondary prevention
2. Oral anticoagulation (OAC)

Evidence-based recommendation:

Uncertainty about net benefit of long-term OAC

Quality of evidence: Low ⊕⊕
Strength of recommendation: -

Consensus statement:

DOAC treatment after ICH seems to increase the risk of ICH but reduces the risk for MACE. DOAC may be considered after careful individual risk evaluation

Examples of criteria to consider: CMB's, CAA, hypertension, alcohol

Ongoing trials

06 Secondary prevention
3. Left atrial appendage occlusion (LAAO) for atrial fibrillation

Quality of evidence: Very low ⊕
Strength of recommendation: -

Evidence-based recommendation:

Uncertainty

Enrolment in trials is recommended

Expert consensus:

LAAO may be considered in patients unsuitable for long-term OAC

Enrolment in RCT's is recommended

Periprocedural antithromobotic treatment according to ESC

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06 Secondary prevention
4. Antiplatelet therapy

Evidence-based recommendation:

Quality of evidence: Moderate ⊕⊕⊕
Strength of recommendation: Weak for intervention ?↑

Res-starting AP for a licensed indication is safe but overall effect is uncertain

Expert consensus:

Enrolment in RCT is encouraged

Do not start AP outside of trials when there is no licensed indication

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06 Secondary prevention
5. Statins

Evidence-based recommendation:

Uncertainty regarding secondary prevention with statin

Quality of evidence: Very low ⊕
Strength of recommendation: -

Expert consensus statement:

Statin treatment in patients with high cardiovascular risk after evaluation of the individual risk-benefit profile

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THANK YOU

for attending the ESO Guideline Webinar

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For further questions please contact the corresponding authors.

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Check out our ESO guidelines:

ESO-EANS Guideline on stroke due to spontaneous intracerebral haemorrhage

ESO Guideline Directory

SAVE THE DATE

6 – 8 May 2026: ESOC in Maastricht – https://eso-stroke.org/esoc2026/