



# Le linee guida sull'Emorragia subaracnoidea: novità dall'Europea

Paolo Gritti

Ospedale Papa Giovanni XXIII° Bergamo

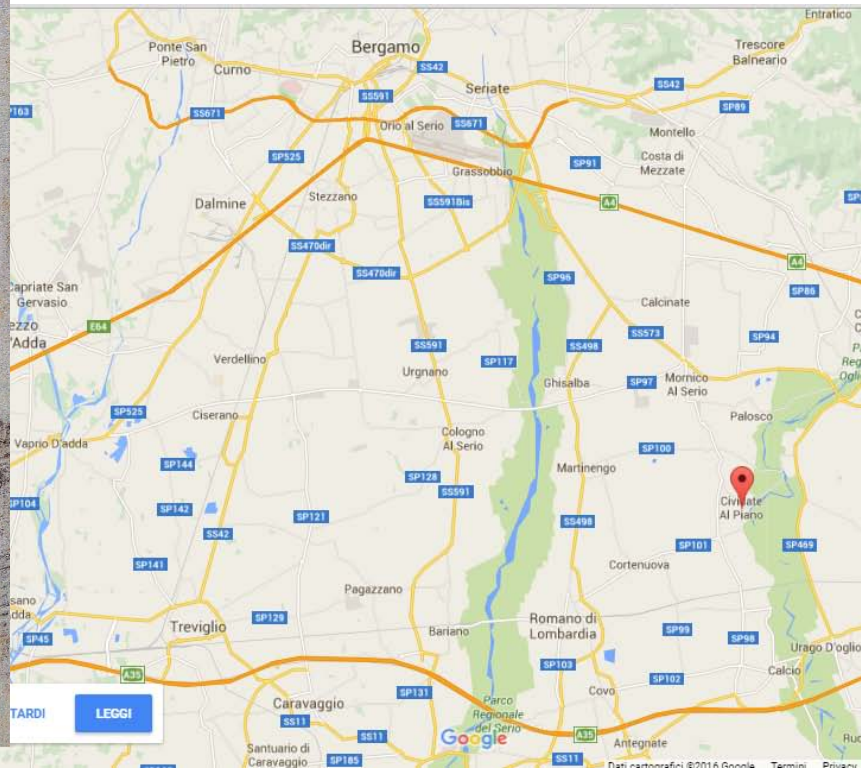
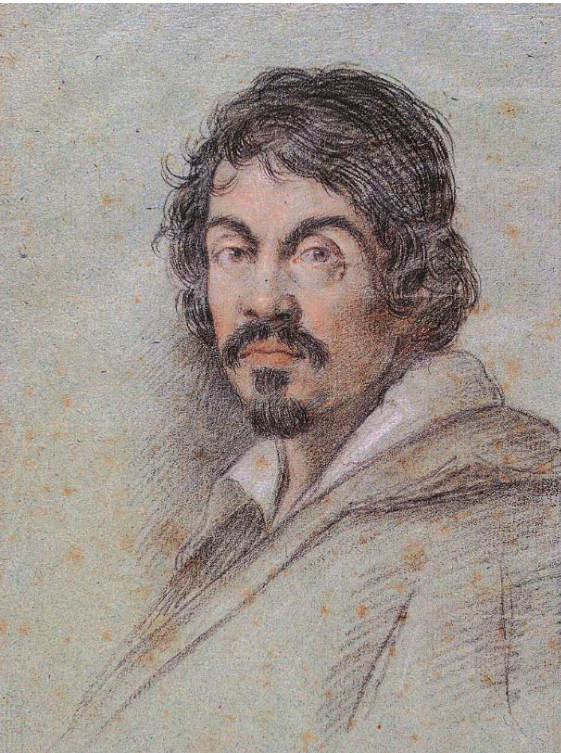
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# Premessa:



Il Anestesia Rianimazione  
Responsabile:  
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Ospedale Papa Giovanni XXIII°  
Bergamo

**Conflitti d'interesse: Nessuno**





Pio Monte della  
Misericordia,  
Napoli







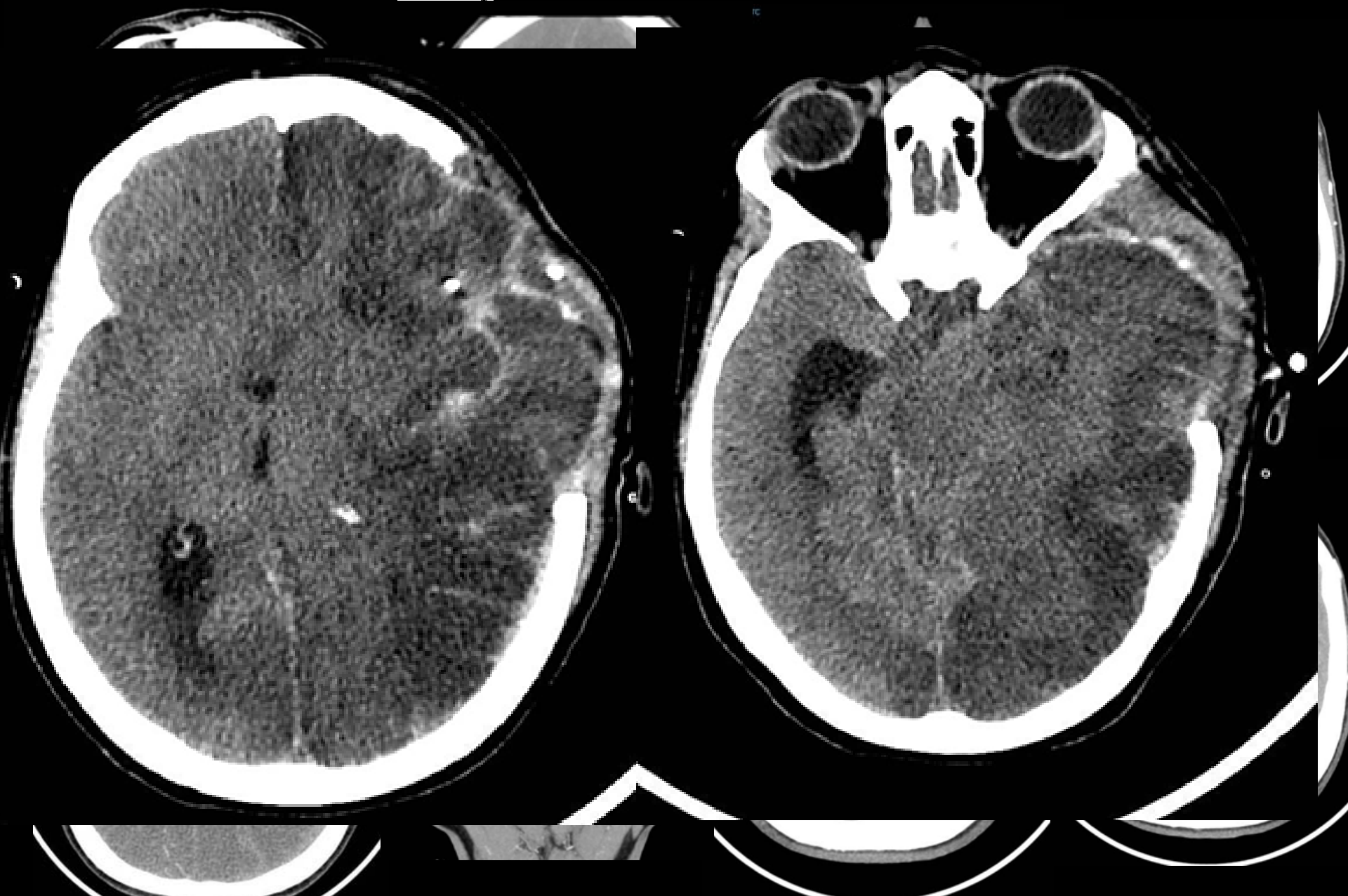




# Sommario:

**Le Linee Guida sull'Emorragia Subaracnoidea:  
Novità dall'Europa**  
Italia



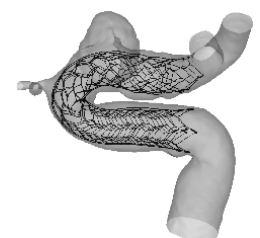
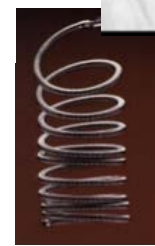
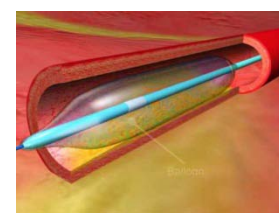
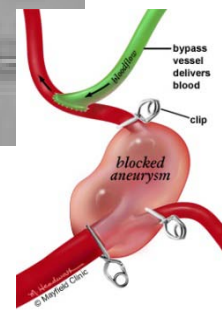
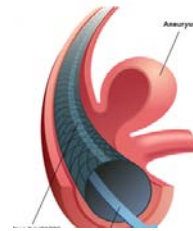
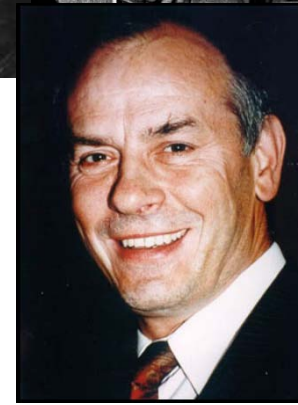
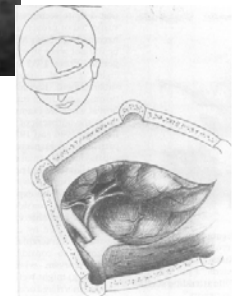
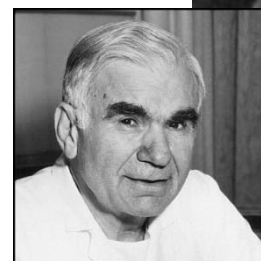
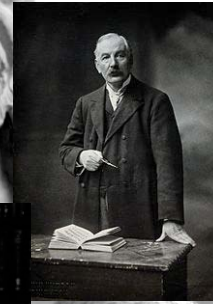
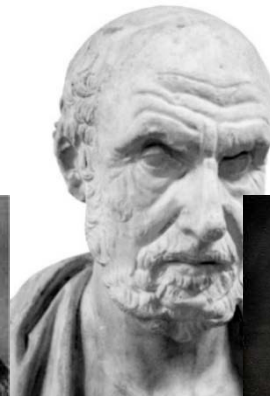


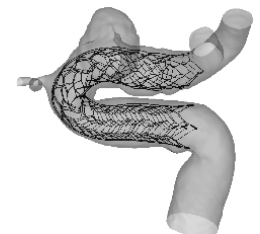
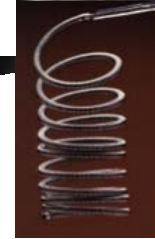
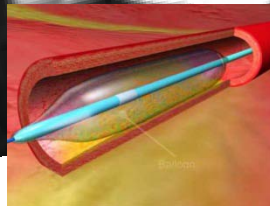
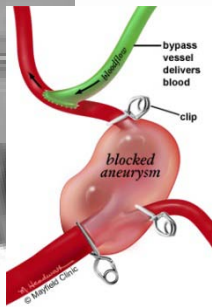
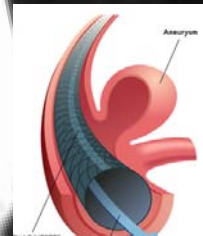
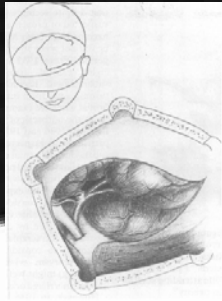
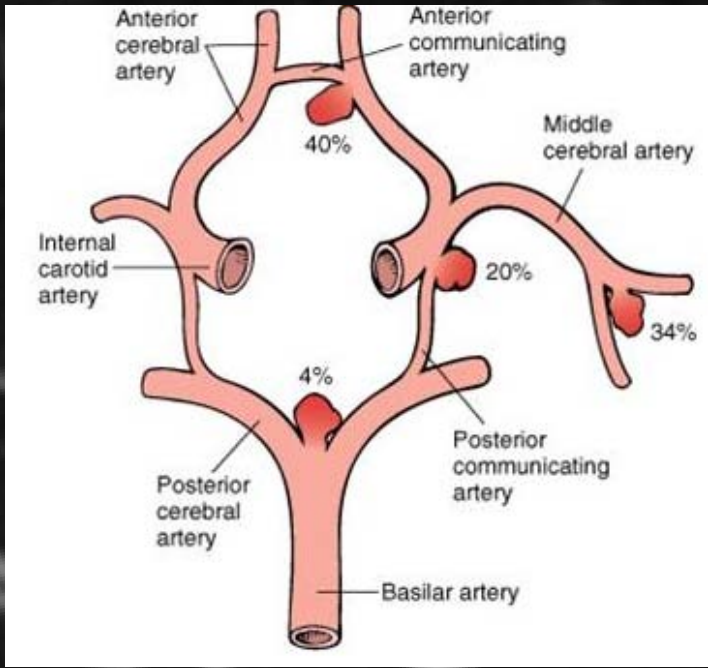
# Le Linee Guida sull'Emorragia Subaracnoidea: Novità dall'Europa





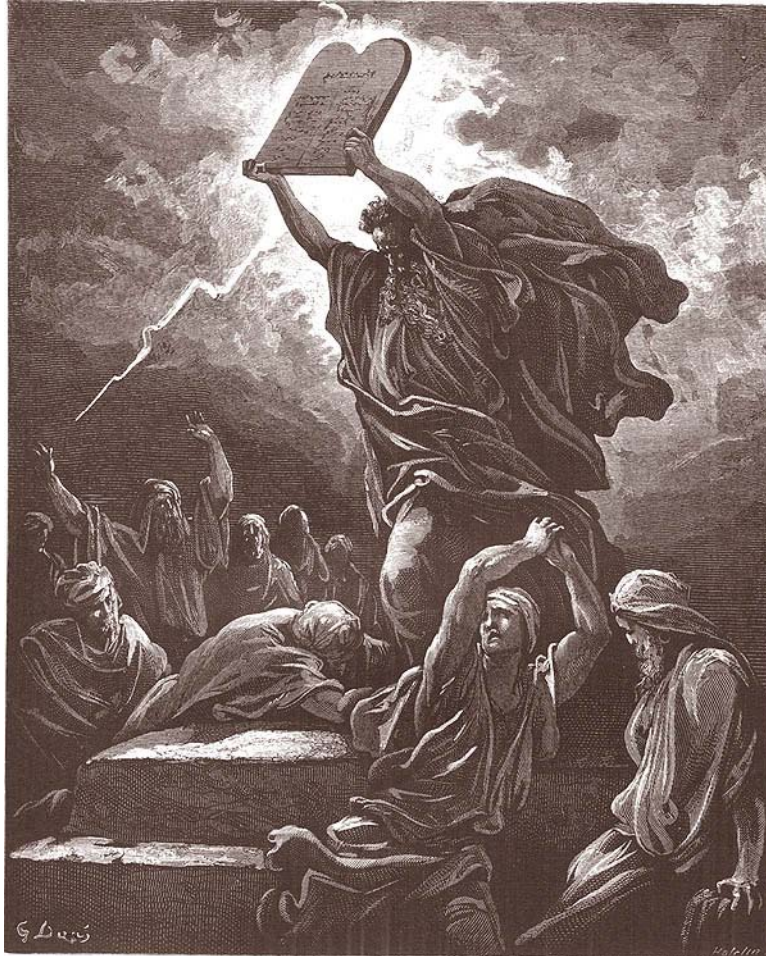
Vallée B. Subarachnoid hemorrhage syndrome and its aneurysmal etiology. From Morgagni to Moniz, Dott and Dandy. A historical overview. Neurochirurgie. 1998 Apr;44:105-10.







Luceram (Provence)



(Esodo 20: 1-17)  
1300-1200 B.C.



1792-1750 B.C.





**A medical guideline** is a document with the aim of guiding decisions and criteria regarding diagnosis, management, and treatment in specific areas of healthcare.

...sono raccomandazioni di comportamento clinico, prodotte attraverso un processo sistematico, allo scopo di assistere medici e pazienti nel decidere quali siano le modalità assistenziali più appropriate in determinate situazioni cliniche. Le linee guide tendono principalmente a migliorare la qualità, l'appropriatezza ed il costoefficacia degli interventi sanitari, nonché a fornire strumenti educativi.

Table 2. Definition of AHA Stroke Council Rec

Table 1. Applying Classification of Recommendation and Level of Evidence

		SIZE OF TREATMENT EFFECT				
		CLASS I	CLASS IIa	CLASS IIb	CLASS III No Benefit or CLASS III Harm	
Class I		Benefit >>> Risk Procedure/Treatment <b>SHOULD</b> be performed/administered	Benefit >> Risk Additional studies with focused objectives needed <b>IT IS REASONABLE</b> to perform procedure/administer treatment	Benefit ≥ Risk Additional studies with broad objectives needed; additional registry data would be helpful Procedure/Treatment <b>MAY BE CONSIDERED</b>	Procedure/ Test COR III: No benefit COR III: Harm	
Class II					Treatment No Proven Benefit Harmful to Patients or Harmful	
Class IIa	ESTIMATE OF CERTAINTY (PRECISION) OF TREATMENT EFFECT	<b>LEVEL A</b> Multiple populations evaluated* Data derived from multiple randomized clinical trials or meta-analyses	■ Recommendation that procedure or treatment is useful/effective ■ Sufficient evidence from multiple randomized trials or meta-analyses	■ Recommendation in favor of treatment or procedure being useful/effective ■ Some conflicting evidence from multiple randomized trials or meta-analyses	■ Recommendation's usefulness/efficacy less well established ■ Greater conflicting evidence from multiple randomized trials or meta-analyses	■ Recommendation that procedure or treatment is not useful/effective and may be harmful ■ Sufficient evidence from multiple randomized trials or meta-analyses
Class IIb			<b>LEVEL B</b> Limited populations evaluated* Data derived from a single randomized trial or nonrandomized studies	■ Recommendation in favor of treatment or procedure being useful/effective ■ Some conflicting evidence from single randomized trial or nonrandomized studies	■ Recommendation's usefulness/efficacy less well established ■ Greater conflicting evidence from single randomized trial or nonrandomized studies	■ Recommendation that procedure or treatment is not useful/effective and may be harmful ■ Evidence from single randomized trial or nonrandomized studies
Class III			<b>LEVEL C</b> Very limited populations evaluated* Only consensus opinion of experts, case studies, or standard of care	■ Recommendation in favor of treatment or procedure being useful/effective ■ Only diverging expert opinion, case studies, or standard of care	■ Recommendation's usefulness/efficacy less well established ■ Only diverging expert opinion, case studies, or standard of care	■ Recommendation that procedure or treatment is not useful/effective and may be harmful ■ Only expert opinion, case studies, or standard of care
Therapeutic recommendation						
Level of Evidence A						
Level of Evidence B						
Level of Evidence C						
Diagnostic recommendations						
Level of Evidence A	Suggested phrases for writing recommendations	should is recommended is indicated is useful/effective/beneficial	is reasonable can be useful/effective/beneficial is probably recommended or indicated	may/might be considered may/might be reasonable usefulness/effectiveness is unknown/unclear/uncertain or not well established	COR III: No Benefit is not recommended is not indicated	COR III: Harm potentially harmful causes harm
Level of Evidence B	Comparative effectiveness phrases†	treatment/strategy A is recommended/indicated in preference to treatment B treatment A should be chosen over treatment B	treatment/strategy A is probably recommended/indicated in preference to treatment B it is reasonable to choose treatment A over treatment B		should not be performed/administered/other is not useful/beneficial/effective	associated with excess morbidity/mortality should not be performed/administered/other
Level of Evidence C						



# Le Linee Guida sull'Emorragia Subaracnoidea: Novità dall'Europa

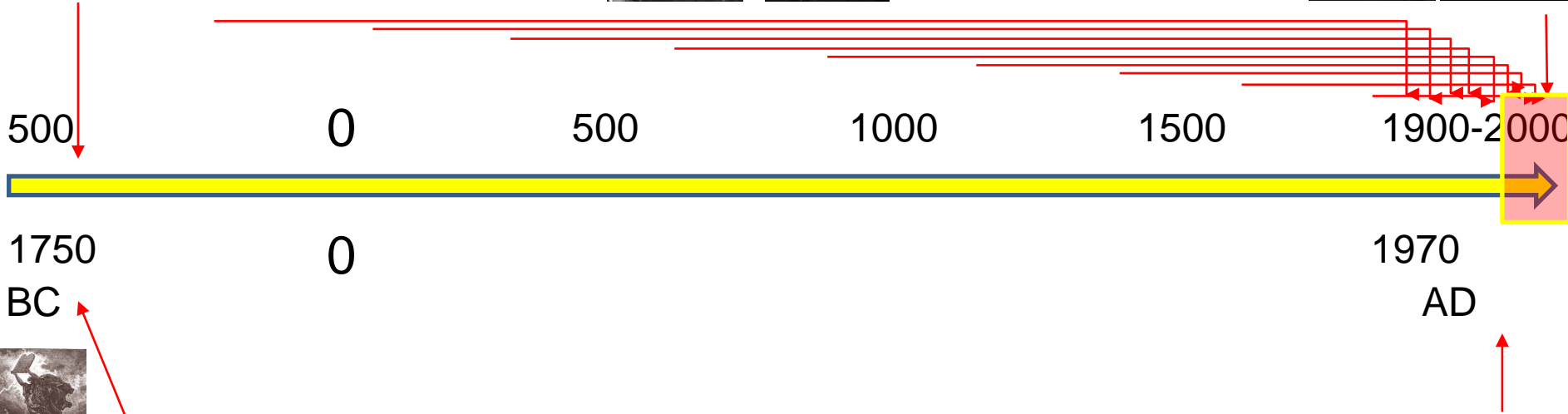


Table 1. Applying Classification of Recommendation and Level of Evidence

CLASSIFICATION OF RECOMMENDATION AND LEVEL OF EVIDENCE	TYPE OF TREATMENT DECISION			
	CLASS I	CLASS IIa	CLASS IIb	CLASS III
DEFINITION	Strong evidence that the benefits of treatment clearly outweigh the risks and burdens.	Strong evidence that the benefits of treatment probably outweigh the risks and burdens.	Weak evidence that the benefits of treatment probably outweigh the risks and burdens.	Weak evidence that the benefits of treatment do not clearly outweigh the risks and burdens.
RECOMMENDATION	Recommendation to use the treatment.	Recommendation to use the treatment.	Recommendation to use the treatment.	Recommendation to use the treatment.
LEVEL OF EVIDENCE	Level I	Level IIa	Level IIb	Level III
DEFINITION	Randomized controlled trial or meta-analysis of randomized controlled trials.	Randomized controlled trial or meta-analysis of randomized controlled trials with some limitations.	Randomized controlled trial or meta-analysis of randomized controlled trials with some limitations.	Non-randomized study or meta-analysis of non-randomized studies.
RECOMMENDATION	Strongly recommended.	Recommended.	Recommended.	Recommended.
LEVEL OF EVIDENCE	Level I	Level IIa	Level IIb	Level III
DEFINITION	Randomized controlled trial or meta-analysis of randomized controlled trials.	Randomized controlled trial or meta-analysis of randomized controlled trials with some limitations.	Randomized controlled trial or meta-analysis of randomized controlled trials with some limitations.	Non-randomized study or meta-analysis of non-randomized studies.
RECOMMENDATION	Strongly recommended.	Recommended.	Recommended.	Recommended.
LEVEL OF EVIDENCE	Level I	Level IIa	Level IIb	Level III
DEFINITION	Randomized controlled trial or meta-analysis of randomized controlled trials.	Randomized controlled trial or meta-analysis of randomized controlled trials with some limitations.	Randomized controlled trial or meta-analysis of randomized controlled trials with some limitations.	Non-randomized study or meta-analysis of non-randomized studies.
RECOMMENDATION	Strongly recommended.	Recommended.	Recommended.	Recommended.



## European Stroke Organization Guidelines for the Management of Intracranial Aneurysms and Subarachnoid Haemorrhage



Thorsten Steiner<sup>a</sup> Seppo Juvela<sup>d</sup> Andreas Unterberg<sup>b</sup> Carla Jung<sup>b</sup>  
Michael Forsting<sup>c</sup> Gabriel Rinkel<sup>e</sup>

Departments of <sup>a</sup>Neurology and <sup>b</sup>Neurosurgery, Heidelberg University, Heidelberg, and <sup>c</sup>Department of Radiology, University of Essen, Essen, Germany; <sup>d</sup>Department of Clinical Neurosciences, University of Helsinki, Helsinki, Finland; <sup>e</sup>Department Neurology, Utrecht University, Utrecht, The Netherlands

neurocritical care society Neurocrit Care (2011) 15:211-240  
DOI 10.1007/s12028-011-9605-9

REVIEW

# 2011

### Critical Care Management of Patients Following Aneurysm Subarachnoid Hemorrhage: Recommendations from the

Guideline



Neurointervention 2014; 9: 63-71  
<http://dx.doi.org/10.5469/neuroint.2014.9.2.63>  
ISSN (Print): 2093-9043 ISSN (Online): 2233-6273

## Clinical Practice Guideline for the Management of Intracranial Aneurysms

Hae Woong Jeong, MD<sup>1</sup>, Jung Hwa Seo, MD<sup>2</sup>, Sung Tae Kim, MD<sup>3</sup>,  
Cheol Kyu Jung, MD<sup>4</sup>, Sang-il Suh, MD<sup>5</sup>

# 2015 2

AHA/ASA Guideline

### Guidelines for the Management of Patients With Unruptured Intracranial Aneurysms

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

*The American Academy of Neurology affirms the value of this guideline as an educational tool for neurologists.*

*Endorsed by the American Association of Neurological Surgeons, the Congress of Neurological Surgeons, and the Society of NeuroInterventional Surgery*

B. Gregory Thompson, MD, Chair; Robert D. Brown, Jr, MD, MPH, FAHA, Co-Chair;  
Sepideh Amin-Hanjani, MD, FAHA; Joseph P. Broderick, MD, FAHA;  
Kevin M. Cockroft, MD, MSc, FAHA; E. Sander Connolly, Jr, MD, FAHA;  
Gary R. Duckwiler, MD, FAHA; Catherine C. Harris, PhD, RN, MBA, CRNP;  
Virginia J. Howard, PhD, MSPH, FAHA; S. Claiborne (Clay) Johnston, MD, PhD;  
Philip M. Meyer, MD, FAHA; Andrew Molyneux, MD; Christopher S. Ogilvy, MD;

*The American Academy of neurology affirms the value of this statement as an educational tool for neurologists*

## 动脉瘤性蛛网膜下腔出血诊治热点问题及展望

张建民

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**[摘要]** 动脉瘤性蛛网膜下腔出血(aSAH)是一类致死率和致残率极高的出血性脑卒中。尽管aSAH临床术前诊断、术中治疗和术后重症监护等方面都获得了很大的进展,但aSAH患者的总体预后并无明显改善。2011年,美国神经危重症协会发布了aSAH患者重症医学处理的推荐意见;2012年,心脏病协会和美国卒中协会更新了2009年aSAH的诊治指南;2013年,欧洲卒中组织制定了欧洲颅内动脉瘤和aSAH诊疗指南;2014年,韩国神经介入学会发布了破裂和未破裂动脉瘤的治疗指南。2015年,中国医师协会神经外科专家委员会也发布了重症aSAH管理专家共识。可见,aSAH的诊治成为神经外科研究的重点和热点。本文总结上述指南中关于aSAH诊断和治疗方面的重点内容、新进展或更新,比较各种用于aSAH诊断的影像学检查的优缺点,探讨手术治疗和血管内治疗的适应证,以期提高aSAH诊治水平,改善患者的预后。

**[关键词]** 蛛网膜下腔出血/诊断;蛛网膜下腔出血/治疗;综述

**[中图分类号]** R741 **[文献标志码]** A

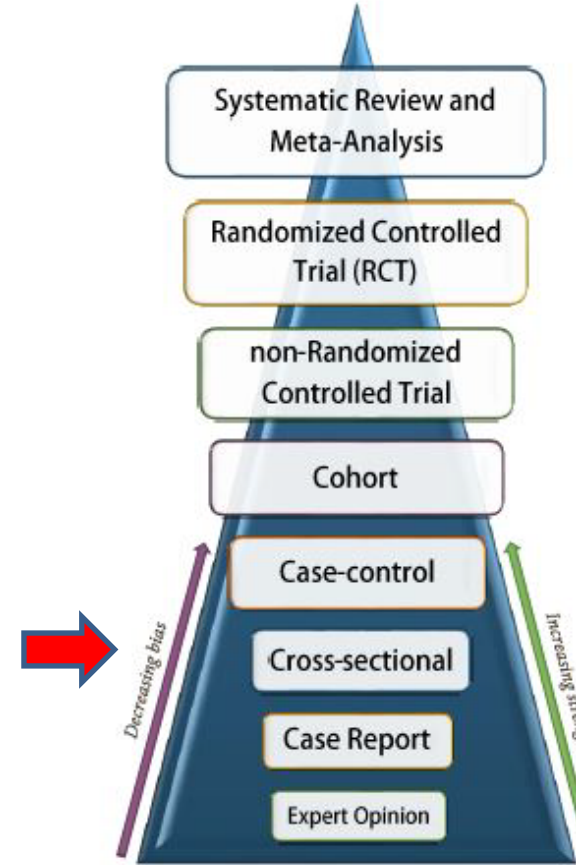
Guidelines for diagnosis and management of aneurysmal subarachnoid hemorrhage: top issues and prospective





Although survey research is common in studies of health, providing a quick, inexpensive and practical approach, may warrant some important limitations.

This is particularly the case when it involves the interpretation of results and the analysis of data, which are mainly descriptive and difficult to make causal inference.<sup>1</sup>



Mann CJ. Observational research methods. Research design II: cohort, cross sectional, and case-control studies. *Emerg Med J* 2003; 20: 54-60.

# Guidelines

Mayberg MR, Batjer HH, Dacey R, Diringer M, Haley EC, Heros RC, Sternau LL, Torner J, Adams HP Jr, Feinberg W, et al. Guidelines for the management of aneurysmal subarachnoid hemorrhage. A statement for healthcare professionals from a special writing group of the Stroke Council, American Heart Association. *Stroke*. 1994 Nov;25(11):2315-28. PubMed PMID: 7974568.

## 2009

Bederson JB, Connolly ES Jr, Batjer HH, Dacey RG, Dion JE, Diringer MN, Duldner JE Jr, Harbaugh RE, Patel AB, Rosenwasser RH; American Heart Association. Guidelines for the management of aneurysmal subarachnoid hemorrhage: a statement for healthcare professionals from a special writing group of the Stroke Council, American Heart Association. *Stroke*. 2009 Mar;40(3):994-1025. doi: 10.1161/STROKEAHA.108.191395. Epub 2009 Jan 22. Review. Erratum in: *Stroke*

## 2012

Diringer MN, Bleck TP, Claude Hemphill J 3rd, Menon D, Shutter L, Vespa P et al; Neurocritical Care Society. Critical care management of patients following aneurysmal subarachnoid hemorrhage: recommendations from the Neurocritical Care Society's Multidisciplinary Consensus Conference. *Neurocrit Care*. 2011;15:211-40.

Connolly ES Jr, Rabinstein AA, Carhuapoma JR, Derdeyn CP, Dion J, Higashida RT et al; American Heart Association Stroke Council; Council on Cardiovascular Radiology and Intervention; Council on Cardiovascular Nursing; Council on Cardiovascular Surgery and Anesthesia; Council on Clinical Cardiology. Guidelines for the management of aneurysmal subarachnoid hemorrhage: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2012;43:1711-37.

Steiner T, Juvela S, Unterberg A, Jung C, Forsting M, Rinkel G; European Stroke Organization. European Stroke Organization guidelines for the management of intracranial aneurysms and subarachnoid haemorrhage. *Cerebrovasc Dis*. 2013;35:93-112.

Jeong HW, Seo JH, Kim ST, Jung CK, Suh SI. Clinical practice guideline for the management of intracranial aneurysms. *Neurointervention*. 2014 Sep;9(2):63-71. doi: 10.5469/neuroint.2014.9.2.63. Epub 2014 Sep 3. Review. PubMed PMID: 25426300; PubMed Central PMCID

## 2015

# Surveys

## 1994

Audibert G, Pottier JC, Hummer M, Torrens J. Anesthesia and intensive care of subarachnoid hemorrhage. A survey on practice in 32 centres. *Ann Fr Anesth Reanim*. 1996;15:338-41.

Sakowitz OW, Raabe A, Vucak D, Kiening KL, Unterberg AW. Contemporary management of aneurysmal subarachnoid hemorrhage in germany: results of a survey among 100 neurosurgical departments. *Neurosurgery*. 2006 Jan;58:137-45.

## 2011

Stevens RD, Naval NS, Mirski MA, Citerio G, Andrews PJ. Intensive care of aneurysmal subarachnoid hemorrhage: an international survey. *Intensive Care Med*. 2009;35:1556-66.

Rama-Maceiras P, Fàbregas N, Ingelmo I, Hernández-Palazón J. [Survey of anesthesiologists' practice in treating spontaneous aneurysmal subarachnoid hemorrhage]. *Rev Esp Anestesiol Reanim*. 2009 Jan;56(1):9-15. Spanish. PubMed PMID: 19284122

Tomycz L, Shekhawat N, Forbes J, Ghiassi M, Ghiassi M, Lockney D, Velez D, Mericle R. The spectrum of management practices in nontraumatic subarachnoid hemorrhage: A survey of high-volume centers in the United States. *Surg Neurol*

## 2014

Al-Hellfi O, Bush S, Ingale H, McConachie N. Management of aneurysmal subarachnoid hemorrhage: a national survey of current practice. *J Neurointerv Surg*. 2014 Oct 20.

Hollingsworth M, Chen PR, Goddard AJ, Coulthard A, Söderman M, Bulsara KR. Results of an International Survey on the Investigation and Endovascular Management of Cerebral Vasospasm and Delayed Cerebral Ischemia. *World Neurosurg*. 2015 Feb 11.

Velly LJ, Bilotta F, Fàbregas N, Soehle M, Bruder NJ, Nathanson MH; for the European Neuroanaesthesia and Critical Care Interest Group (ENIG). Anaesthetic and ICU management of aneurysmal subarachnoid haemorrhage: A survey of European practice. *Eur J Anaesthesiol*. 2015 may 9

## Guidelines for the Management of Aneurysmal Subarachnoid Hemorrhage

A Statement for Healthcare Professionals  
From a Special Writing Group of the Stroke Council,  
American Heart Association

### Vasospasm: Summary and Recommendations

1. Oral **nifedipine** is strongly recommended to reduce poor outcome related to vasospasm (level of evidence I to II, grade A). Other calcium antagonists administered orally or intravenously are of uncertain value (level of evidence I to V, grade B).

2. **Hypertension/hypervolemia/hemodilution** are recommended for prevention and treatment of ischemic complications from vasospasm (level of evidence III to V, grade C). **The aneurysm should be clipped** when possible, and patients receiving this therapy should be closely monitored in an intensive care setting for hemodynamic function. Clinical trials are recommended to further document the efficacy of this therapy.

3. Intracisternal fibrinolysis and antioxidant and anti-inflammatory agents are of uncertain value (level of evidence III to V, grade C). Studies to determine their efficacy are recommended.

4. **Transluminal angioplasty** is recommended for treatment of vasospasm in patients for whom conventional therapy has failed (level of evidence IV to V, grade C). Further studies are recommended.

1. **Surgical clipping is strongly recommended** to reduce the rate of rebleeding after aneurysmal SAH (level of evidence III to V, grade B).

4. The use of **intraluminal coils and balloons** is experimental. Further studies are recommended (level of evidence IV to V, grade C).



## Anesthésie-réanimation de l'hémorragie sous-arachnoïdienne. Enquête sur les pratiques de 32 centres

G Audibert, JC Pottie, M Hummer, J Torrens

Service d'anesthésie-réanimation, hôpital central, 29, avenue du Maréchal-de-Lattre-de-Tassigny, 54037 Nancy, France

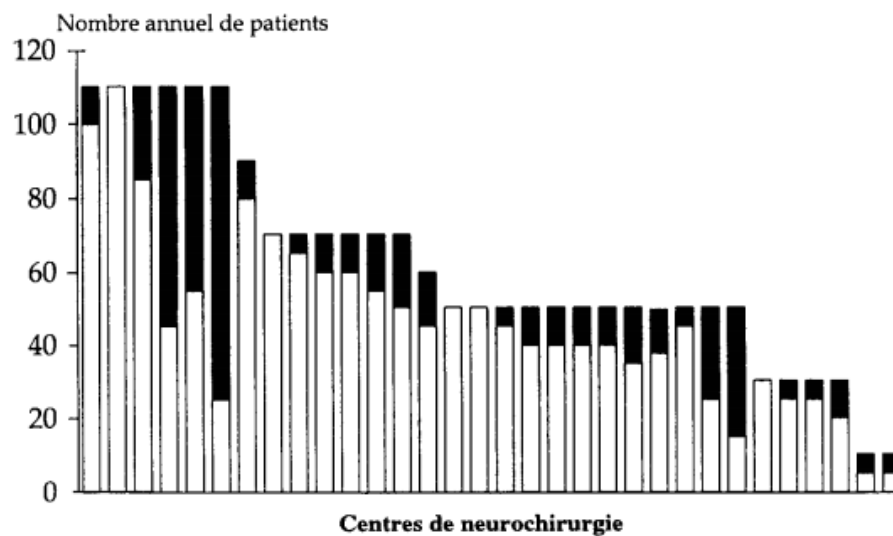


Fig 1. Modalités thérapeutiques des hémorragies sous-arachnoïdiennes dans 32 centres de neurochirurgie ; ■ : traitement endovasculaire ; □ : chirurgie.



Oliver W. Sakowitz, M.D.

CONTEMPORARY MANAGEMENT OF ANEURYSMAL

Department of  
University of  
Heidelberg, C

TABLE 2. Standardization in the clinical management of subarachnoid hemorrhage patients<sup>a</sup>

	Protocol	Individualized
Preoperative diagnostics	77	23
Aneurysm obliteration	44	56
Postoperative diagnostics	56	44
ICU monitoring	65	35
ICU therapy	64	36
Treatment of vasospasm	59	41
Follow-up	46	54

<sup>a</sup> ICU, intensive care unit.

TABLE 3. Surgi

Anterior circulat  
aneurysms  
Surgical  
Endovascular  
Posterior circula  
aneurysms  
Surgical  
Endovascular

TABLE 4. Adjun  
obliteration<sup>a</sup>

rTPA<sup>b</sup>  
Papaverine<sup>b</sup>  
Barbiturates  
Hypothermia  
Cardiac arrest  
EC/IC bypass

<sup>a</sup> rTPA, recombin  
intracranial.  
<sup>b</sup> Cisternal irrigati

monitoring techniques<sup>a</sup>

	Respondents (%)		
ly	Frequently	Rarely	Never
	7	0	0
	40	19	0
	16	53	13
	4	12	83
	15	17	65
	0	6	94
	0	2	98
	2	17	81

N. Contemporary  
army: results of a



Unter Mitwirkung von  
A. Raabe<sup>1</sup>  
J. Beck<sup>1</sup>  
J. Berkefeld<sup>2</sup>  
W. Deinsberger<sup>3</sup>  
J. Meixensberger<sup>4</sup>  
P. Schmiedek<sup>5</sup>  
V. Seifert<sup>1</sup>  
H. Steinmetz<sup>6</sup>  
A. Unterberg<sup>7</sup>  
P. Vajkoczy<sup>5</sup>  
C. Werner<sup>8</sup>

## Empfehlungen zum Management der aneurysmatischen Subarachnoidalblutung

Sektion vaskuläre Neurochirurgie der Deutschen Gesellschaft für  
Neurochirurgie und Wissenschaftlicher Arbeitskreis Neuroanästhesie der  
Deutschen Gesellschaft für Anästhesiologie und Intensivmedizin

*Recommendations for the Management of Patients with Aneurysmal  
Subarachnoid Hemorrhage*

Conse



Raabe A, Beck J, Berkefeld J, Deinsberger W, Meixensberger J, Schmiedek P, Seifert V, Steinmetz H, Unterberg A, Vajkoczy P, Werner C: Recommendations for the management of patients with aneurysmal subarachnoid hemorrhage. **Zentralbl Neurochir** 66:79–91, 2005.

Today, evidence-based guidelines for the clinical management of SAH are among the most recent achievements (21, 29). It is predicted that standardized treatment will decrease uncertainties and increase overall patient outcome. The authors are looking forward to future surveys that will complement these data and that will measure compliance with published guidelines.

Sakowitz OW, Raabe A, Vucak D, Kiening KL, Unterberg AW. Contemporary management of aneurysmal subarachnoid hemorrhage in germany: results of a survey among 100 neurosurgical departments. *Neurosurgery*. 2006 Jan;58(1):137-45;

# 2009

## Guidelines for the Management of Aneurysmal Subarachnoid Hemorrhage

A Statement for Healthcare Professionals From a Special Writing Group of the Stroke Council, American Heart Association

### Aneurysms: Summary and Recommendations

Table 1. Randomized Clinical Trials in Aneurysmal SAH: 1995 to 2006 (by Therapeutic Modality)

Authors	Year	Therapy	n	Benefit
Van den Bergh et al <sup>115</sup>	2006	Aspirin	161	No less DIND
Hop et al <sup>116</sup>	2000	Aspirin	50	No improvement in 4-mo outcome
Schmid-Eassner <sup>69</sup>	2006	Magnesium	113	No better outcome than nimodipine
Wong et al <sup>176</sup>	2006	Magnesium	60	No better outcome
Van den Bergh et al <sup>69</sup>	2005	Magnesium	283	Less DCI and poor outcome
Veyna <sup>200</sup>	2002	Magnesium	40	No less clinical vasospasm
Molyneux et al <sup>125</sup>	2005	GDC	2143	Less mortality/epilepsy, more neurologic improvement
Molyneux et al <sup>228</sup>	2002	GDC	2143	Less mortality, better outcome
Kolivisto et al <sup>259</sup>	2000	GDC	109	No improvement in 12-mo outcome
Vanninen <sup>261</sup>	1999	GDC	109	No improvement in 3-mo outcome
Vajkoczy et al <sup>225</sup>	2005	ET antagonist	32	Less incidence/intensity of angiographic vasospasm
Shaw et al <sup>68</sup>	2000	ET antagonist	420	Trend to less DIND, no better outcome
Lynch et al <sup>423</sup>	2005	Statin (simvastatin)	39	Reduced incidence of clinical vasospasm
Tseng et al <sup>429</sup>	2005	Statin (pravastatin)	80	Less mortality/incidence of TCD vasospasm
Anderson <sup>222</sup>	2006	Hypothermia	1001	No neuropsychological benefit
Todd et al <sup>264</sup>	2005	Hypothermia	1001	No improvement in 3-mo outcome
Karibe <sup>243</sup>	2000	Hypothermia	24	Immediate CSF improvement
Hindman <sup>244</sup>	1999	Hypothermia	114	Improved outcome at 3 and 6 months
Ditinger <sup>265</sup>	2004	Normothermia	296	Reduced fever burden with catheters
Reinert et al <sup>427</sup>	2004	TD NTG	17	Raised CBF
Klopfenstein et al <sup>460</sup>	2004	Drain wean	81	No difference in stunted hydrocephalus
Wurm et al <sup>417</sup>	2004	Enoxaparin	117	No less TCD vasospasm
Sironen et al <sup>418</sup>	2003	Enoxaparin	170	No improvement in 3-mo outcome
Mori <sup>206</sup>	2003	Hydrocortisone	28	Improved sodium balance
Mori et al <sup>66</sup>	1999	Fludrocortisone	30	No improvement in 6-mo outcome
Mayer et al <sup>261</sup>	1998	5% Albumin	43	Improved sodium balance
Hamada <sup>207</sup>	2003	IT urokinase	110	Reduced symptomatic vasospasm
Findlay <sup>208</sup>	1995	IT rtPA	91	No decrease in angiographic vasospasm
Hillman et al <sup>40</sup>	2002	Tranexamic A	505	Reduced rebleeding, no effect on mortality
Roos <sup>200</sup>	2000	Tranexamic A	462	Reduced rebleeding, no effect on mortality
Egge et al <sup>289</sup>	2001	Hypervolemia	32	No effect on clinical/TCD vasospasm
Lennihan et al <sup>285</sup>	2000	Hypervolemia	82	No less symptomatic vasospasm
Lanzino et al <sup>419</sup>	1999	Tirilizad (F-NA)	823	No improvement in 3-mo outcome
Lanzino et al <sup>420</sup>	1999	Tirilizad (F-E)	819	No improvement in 3-mo outcome
Haley et al <sup>421</sup>	1997	Tirilizad (NA)	897	No improvement in 3-mo outcome
Kassell et al <sup>422</sup>	1996	Tirilizad (E)	1015	No improvement in 3-mo outcome
Salto et al <sup>423</sup>	1998	Ebselen	286	No less DIND but improved outcome
Asano et al <sup>424</sup>	1996	Ebselen	162	Decreased incidence of DIND

1. Oral nimodipine is indicated to reduce poor outcome related to aneurysmal SAH (Class I, Level of Evidence A). The value of other calcium antagonists, whether administered orally or intravenously, remains uncertain.
2. Treatment of cerebral vasospasm begins with early management of the ruptured aneurysm, and in most cases maintaining normal circulating blood volume and avoiding hypovolemia are probably indicated (Class IIa, Level of Evidence B).
3. One reasonable approach to symptomatic cerebral vasospasm is volume expansion, induction of hypertension, and hemodilution (triple-H therapy) (Class IIa, Level of Evidence B).
4. Alternatively, cerebral angioplasty and/or selective intraarterial vasodilator therapy may be reasonable after together with, or in the place of triple-H therapy, depending on the clinical scenario (Class IIb, Level of Evidence B).

recommendations are listed in Table 2. The rate of agreement did not depend on the quality of the supporting evidence (agreement for grade A and B interventions, respectively, 74 and 64%,  $P = 0.17$ ).

Society for Critical Care Medicine (SCCM),  
The European Society of Critical Care Medicine (ESICM),  
Neurocritical Care Society (NCS)

### Objective:

Table 2 Agreement with evidence in SAH management

Intervention	Level of evidence <sup>a</sup>	Recommendation <sup>a</sup>	Percent agreement entire sample <sup>b</sup> (95% CI)	Percent agreement by geographic location			Percent agreement by SAH case volume		
				North America	Europe	<i>P</i> value	High volume	Low volume	<i>P</i> value
Coiling in ISAT candidate <sup>c</sup>	B	I	57 (53–61)	55	70	0.0008	61	51	0.06
Nimodipine <sup>d</sup>	A	I	78 (75–81)	82	78	0.29	81	73	0.027
Early aneurysm repair <sup>e</sup>	B	IIa	84 (80–86)	89	86	0.42	90	74	<0.0001
Treatment in a high-volume center <sup>f</sup>	B	IIa	62 (58–65)						
Control of elevated blood pressure <sup>g</sup>	B	I	92 (90–94)	98	87	<0.0001	92	94	0.35
Control of hyperthermia <sup>h</sup>	B	IIa	79 (76–82)	79	80	0.91	83	71	0.0009
TCD to assess cerebral perfusion	A	IIa	70 (67–74)	73	69	0.23	75	62	0.0006
Therapeutic triple-H <sup>i</sup>	B	IIa	52 (48–56)	94	91	0.23	94	89	0.03
Admission to a neurosciences ICU <sup>j</sup>	B	IIb	39 (35–43)						
CTA to identify ruptured aneurysm	B	IIb	59 (55–63)	64	53	0.025	61	51	0.06
Seizure prophylaxis <sup>k</sup>	B	IIb	31 (27–35)	43	12	<0.0001	63	67	0.39
Prophylactic heparin <sup>l</sup>	B	IIb	74 (70–77)	64	86	<0.0001	79	65	0.004
Intensive glycemic control <sup>m</sup>	B	IIb	56 (52–60)	63	53	0.004	57	53	0.32
Hematocrit > 30% <sup>n</sup>	B	IIb	67 (63–70)	68	64	0.14	67	68	0.79
Antifibrinolytic agents <sup>o</sup>	A	III	91 (88–93)	92	89	0.17	91	90	0.38
Glucocorticoids <sup>p</sup>	A	III	73 (69–76)	68	78	0.01	72	74	0.52
Prophylactic triple-H <sup>q</sup>	B	III	61 (57–64)	64	56	0.069	66	51	<0.0001

Nimodipine



Glucocorticoids



## Conclusion

This study demonstrates that attitudes and practices of ICU physicians are heterogeneous and frequently at variance with available evidence on SAH management.

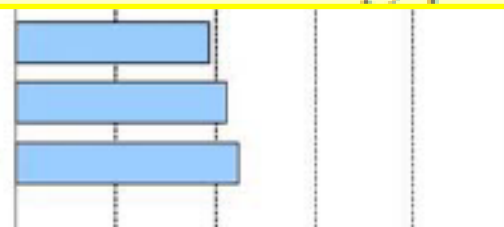
Heterogeneous practice patterns reflect different levels of knowledge of existing evidence, differences in the interpretation of this evidence, poor quality evidence, conflicting evidence, or the absence of evidence. There are examples of each of these deficiencies in SAH management [18–20, 22].

Heterogeneity can adversely affect patient outcome, in particular if beneficial interventions are not being adequately implemented or if ineffective or harmful ones are being pursued [61].

All patients

High risk patients

Only if seizure activity

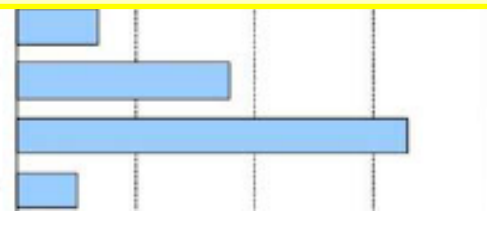


Prophylactic on admission

Prophylactic post-repair

Symptomatic vasospasm

Never



# Survey of anesthesiologists' practice in treating spontaneous aneurysmal subarachnoid hemorrhage



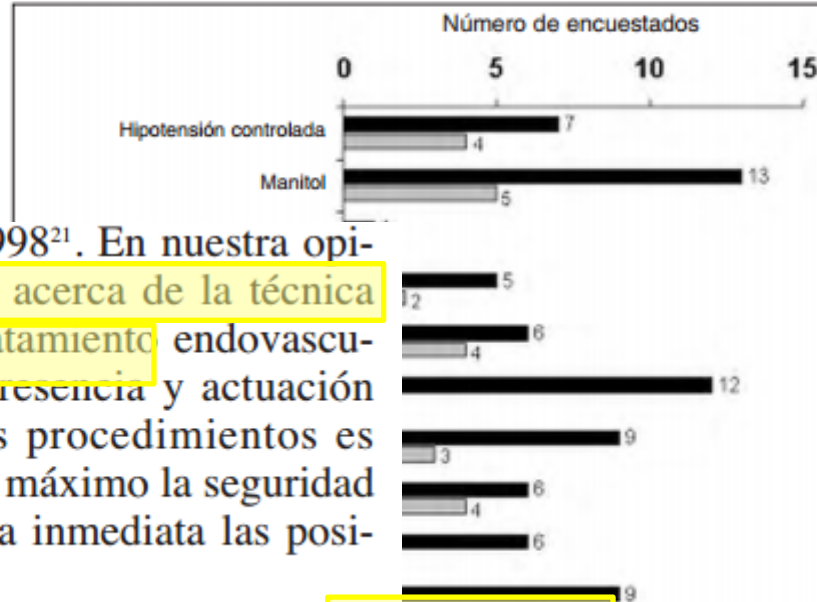
(Rev. Esp. Anestesiología y Reanimación. 2009; 56: 9-15)

ORIGINAL

## Monitorización perioperatoria:

Preoperatorio  
n (%)

No contestadas 3  
Presión arterial invasiva 11 (91,6)



## Prácticas preoperatorias y postoperatorias (craneotomía) de los pacientes según la encuesta

	Preoperatorio n (%)	Postoperatorio n (%)
Analgesia	4	1
Antieméticos	11 (100)	14 (100)
Antidopaminérgicos	8 (72,7)	9 (64,2)
Antiepilepticos	11 (100)	11 (78,5)
Antidépresivos	10 (90,9)	9 (64,2)
Cuidados físicos	2 (18,1)	5 (35,7)
Cuidados de enfermería	2 (18,1)	7 (50)
Cuidados de enfermería de enfermería	11 (100)	14 (100)
Cuidados de enfermería de enfermería	7 (63,6)	12 (85,7)
Intervención intestinal	1 (9,1)	1 (7,1)
Intervención intestinal	7 (63,6)	7 (50)
Antipiréticos	11 (100)	14 (100)
Antipiréticos	11 (100)	14 (100)
Antipiréticos	6 (54,5)	11 (78,5)
Antipiréticos	0 (0)	0 (0)
Control de la sonda	5 (45,4)	4 (28,5)

superior al 14,3% recogido en 1998<sup>21</sup>. En nuestra opinión, aunque no existe consenso acerca de la técnica anestésica de elección para el tratamiento endovascular (general o sedación)<sup>35-40</sup>, la presencia y actuación del anestesiólogo durante estos procedimientos es imprescindible, para garantizar al máximo la seguridad de los pacientes y tratar de forma inmediata las posibles complicaciones.

Sería recomendable el esfuerzo de profesionales y de nuestras sociedades científicas para unificar la actuación clínica ante el paciente neurocrítico por HSA. El anestesiólogo que maneja este tipo de pacientes, además de tener pericia y conocimientos generales, debe ser experto en neurociencia<sup>57-60</sup>.

- Capnografía
- Monitorización
- Diuresis horaria
- Temperatura cerebral
- Ionograma sérico
- Hemoglobina sérica
- Recuento de plaquetas
- Glucemias séricas
- Albúmina sérica
- Troponinas séricas
- Gasometrías séricas
- Control TCA

N: número de n.  
ma. TCA: tiempo



- About the treatment with systemic **steroids**, 3.4% believed that it improves survival, 3.4% believed that it increases overall mortality, 10.3% believed that it improves neurological outcomes, 31% believed that it alleviates headache, and 51.7% believed that they don't have clinical effects in patients with aneurysmal SAH.
- Thirteen percent do not use prophylactic **anticonvulsant therapy**. Other groups include use for less than three days (19%), three to five days (5.2%), five to seven days (48.3%), and until the day after aneurysm exclusion (13.8%).
- Reported compliance of evidence-based clinical guidelines was similar to that described in developed countries, **and even better.** 18

# The spectrum of management practices in nontraumatic subarachnoid hemorrhage: A survey of high-volume centers in the United States.

Tomycz L<sup>1</sup>, Shekhawat N, Forbes J, Ghiassi M, Ghiassi M, Lockney D, Velez D, Mericle F

Randomized, double-blind, placebo-controlled, pilot

Use of nimodipine in SAH		
Use of antiepileptic drugs (AEDs) in SAH		
Use prophylactic AEDs on every patient	40.3	therapy on every only if patient s of vasospasm,
Use AEDs selectively	59.7	f patient s of vasospasm,
Preferred AED		on every
Leviracetam	57.6	
Phenytoin	36.4	
Leviracetam and/or Phenytoin	6.1	

KEYWORDS: Corticosteroids; subarachnoid hemorrhage; vasospasm

- This survey illustrates **the astonishing variety** of treatment practices for patients with ntSAH and underscores the need for further study.



## Guidelines for the Management of Aneurysmal Subarachnoid Hemorrhage

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

*The American Academy of Neurology affirms the value of this statement as an educational tool for neurologists.*

*Endorsed by the American Association of Neurological Surgeons and Congress of Neurological Surgeons; and by the Society of NeuroInterventional Surgery*

E. Sander Connolly, Jr, MD, FAHA, Chair; Alejandro A. Rabinstein, MD, Vice Chair; J. Ricardo Carhuapoma, MD, FAHA; Colin P. Derdeyn, MD, FAHA; Jacques Dion, MD, FRCPC; Randall T. Higashida, MD, FAHA; Brian L. Hoh, MD, FAHA; Catherine J. Kirkness, PhD, RN; Andrew M. Naidech, MD, MSPH; Christopher S. Ogilvy, MD; Aman B. Patel, MD; B. Gregory Thompson, MD; Paul Vespa, MD, FAAN; on behalf of the American Heart Association Stroke Council, Council on Cardiovascular Radiology and Intervention, Council on Cardiovascular Nursing, Council on Cardiovascular Surgery and Anesthesia, and Council on Clinical Cardiology

# 2011

- Hypothalamic dysfunction should be considered in patients who are unresponsive to vasopressors. The optimal method of diagnosis remains unclear (moderate quality evidence—weak recommendation).
- Administration of high dose corticosteroids is not recommended in acute SAH (high quality evidence—weak recommendation)
- Hormonal replacement with mineralocorticoids should be considered in acute SAH to prevent hypovolemia and hyponatremia (moderate quality evidence—weak recommendation).
- Hormonal replacement with stress-dose corticosteroids for patients with vasospasm and unresponsiveness to induced hypertension may be considered (weak quality evidence—weak recommendation).

22 class I  
 22 new  
 9 revised

# 2012

**Table 3. Class I Recommendations**

Level of Evidence	Recommendation
A	1. Treatment of high blood pressure with antihypertensive medication is recommended to prevent ischemic stroke, intracerebral hemorrhage, and cardiac, renal, and other end-organ injury.
A	2. Oral nimodipine should be administered to all patients with aSAH. (It should be noted that this agent has been shown to improve neurological outcomes but not cerebral vasospasm. The value of other calcium antagonists, whether administered orally or intravenously, remains uncertain.)
B	1. Hypertension should be treated, and such treatment may reduce the risk of aSAH.
B	2. Tobacco use and alcohol misuse should be avoided to reduce the risk of aSAH.
B*	3. After any aneurysm repair, immediate cerebrovascular imaging is generally recommended to identify remnants or recurrences of the aneurysm that may require treatment.
B	4. The initial clinical severity of aSAH should be determined rapidly by use of simple validated scales (eg, Hunt and Hess, World Federation of Neurological Surgeons), because it is the most useful indicator of outcome after aSAH.
B	5. The risk of early aneurysm rebleeding is high and is associated with very poor outcomes. Therefore, urgent evaluation and treatment of patients with suspected aSAH is recommended.
B	6. aSAH is a medical emergency that is frequently misdiagnosed. A high level of suspicion for aSAH should exist in patients with acute onset of severe headache.
B	7. Acute diagnostic workup should include noncontrast head CT, which, if nondiagnostic, should be followed by lumbar puncture.
B*	8. DSA with 3-dimensional rotational angiography is indicated for detection of aneurysm in patients with aSAH (except when the aneurysm was previously diagnosed by a noninvasive angiogram) and for planning treatment (to determine whether an aneurysm is amenable to coiling or to open microsurgery).
B*	9. Between the time of aSAH symptom onset and aneurysm obliteration, blood pressure should be controlled with a titratable agent to balance the risk of stroke, hypertension-related rebleeding, and maintenance of cerebral perfusion pressure.
B	10. Surgical clipping or endovascular coiling of the ruptured aneurysm should be performed as early as feasible in the majority of patients to reduce the rate of rebleeding after aSAH.
B	11. Complete obliteration of the aneurysm is recommended whenever possible.
B†	12. For patients with ruptured aneurysms judged to be technically amenable to both endovascular coiling and neurosurgical clipping, endovascular coiling should be considered.
B*	13. In the absence of a compelling contraindication, patients who undergo coiling or clipping of a ruptured aneurysm should have delayed follow-up vascular imaging (timing and modality to be individualized), and strong consideration should be given to retreatment, either by repeat coiling or microsurgical clipping, if there is a clinically significant (eg, growing) remnant.
B†	14. Low-volume hospitals (eg, <10 aSAH cases per year) should consider early transfer of patients with aSAH to high-volume centers (eg, >35 aSAH cases per year) with experienced cerebrovascular surgeons, endovascular specialists, and multidisciplinary neuro-intensive care services.
B†	15. Maintenance of euvolemia and normal circulating blood volume is recommended to prevent DCI.
B†	16. Induction of hypertension is recommended for patients with DCI unless blood pressure is elevated at baseline or cardiac status precludes it.
B†	17. aSAH-associated acute symptomatic hydrocephalus should be managed by cerebrospinal fluid diversion (EVD or lumbar drainage, depending on the clinical scenario).
B*	18. Hepatin-induced thrombocytopenia and deep venous thrombosis, although infrequent, are not uncommon occurrences after aSAH. Early identification and targeted treatment are recommended, but further research is needed to identify the best screening paradigms.
C†	1. Determination of aneurysm treatment, as judged by both experienced cerebrovascular surgeons and endovascular specialists, should be a multidisciplinary decision based on characteristics of the patient and the aneurysm.
C†	2. aSAH-associated chronic symptomatic hydrocephalus should be treated with permanent cerebrospinal fluid diversion.





2015

**AHA/ASA Guideline**

**Guidelines for the Management of Patients With Unruptured Intracranial Aneurysms**

**A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association**

*The American Academy of Neurology affirms the value of this guideline as an educational tool for neurologists.*

*Endorsed by the American Association of Neurological Surgeons, the Congress of Neurological Surgeons, and the Society of NeuroInterventional Surgery*

B. Gregory Thompson, MD, Chair; Robert D. Brown, Jr, MD, MPH, FAHA, Co-Chair; Sepideh Amin-Hanjani, MD, FAHA; Joseph P. Broderick, MD, FAHA; Kevin M. Cockroft, MD, MSc, FAHA; E. Sander Connolly, Jr, MD, FAHA; Gary R. Duckwiler, MD, FAHA; Catherine C. Harris, PhD, RN, MBA, CRNP; Virginia J. Howard, PhD, MSPH, FAHA; S. Claiborne (Clay) Johnston, MD, PhD; Philip M. Meyers, MD, FAHA; Andrew Molyneux, MD; Christopher S. Ogilvy, MD; Andrew J. Ringer, MD; James Torner, PhD, MS, FAHA; on behalf of the American Heart Association Stroke Council, Council on Cardiovascular and Stroke Nursing, and Council on Epidemiology and Prevention

**Cerebrovascular Diseases**

**Guidelines**

Cerebrovasc Dis 2013;35:93-112  
DOI: [10.1159/000346087](https://doi.org/10.1159/000346087)



**European Stroke Organization Guidelines for the Management of Intracranial Aneurysms and Subarachnoid Haemorrhage**

2013

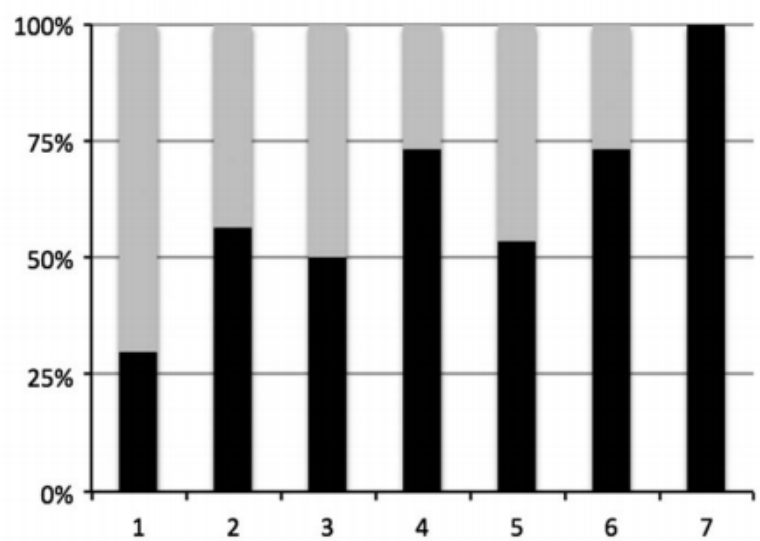
Thorsten Steiner<sup>a</sup> Seppo Juvela<sup>d</sup> Andreas Unterberg<sup>b</sup> Carla Jung<sup>b</sup>  
Michael Forsting<sup>c</sup> Gabriel Rinkel<sup>e</sup>

Departments of <sup>a</sup>Neurology and <sup>b</sup>Neurosurgery, Heidelberg University, Heidelberg, and <sup>c</sup>Department of Radiology, University of Essen, Essen, Germany; <sup>d</sup>Department of Clinical Neurosciences, University of Helsinki, Helsinki, Finland; <sup>e</sup>Department Neurology, Utrecht University, Utrecht, The Netherlands

However, those guidelines mainly deal with SAH from ruptured aneurysm and there might be some differences in the conception of technical and management aspects and in terms of epidemiology. Therefore, it is necessary to publish guidelines on the management of SAH and unruptured aneurysms from a European standpoint.



■ No ■ Ye



- 1: Does your Centre have a written policy defining the optimal timing of treatment of aSAH patients?
- 2 Do you have a written policy for pre-operative care of aSAH patients?
- 3 Do you offer neuro-interventional service 7 days a week?
- 4 Do you always offer coiling/clipping in 48hrs from the onset of SAH(headache)?
- 5 Is there a specialist SAH nurse in your unit?

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See you at **ESNO 2016**  
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The 2<sup>nd</sup> European Stroke Organisation Conference 2016  
10-12 May, 2016 | Barcelona, Spain

**LATEST NEWS**

Majority of UK neurosurgical units following published recommendations, but room for improvement remains

10th November 2014 20 0



**Trevo Stroke Solutions**

FlowGuide  
TriaxiP  
AAS Catalyst II

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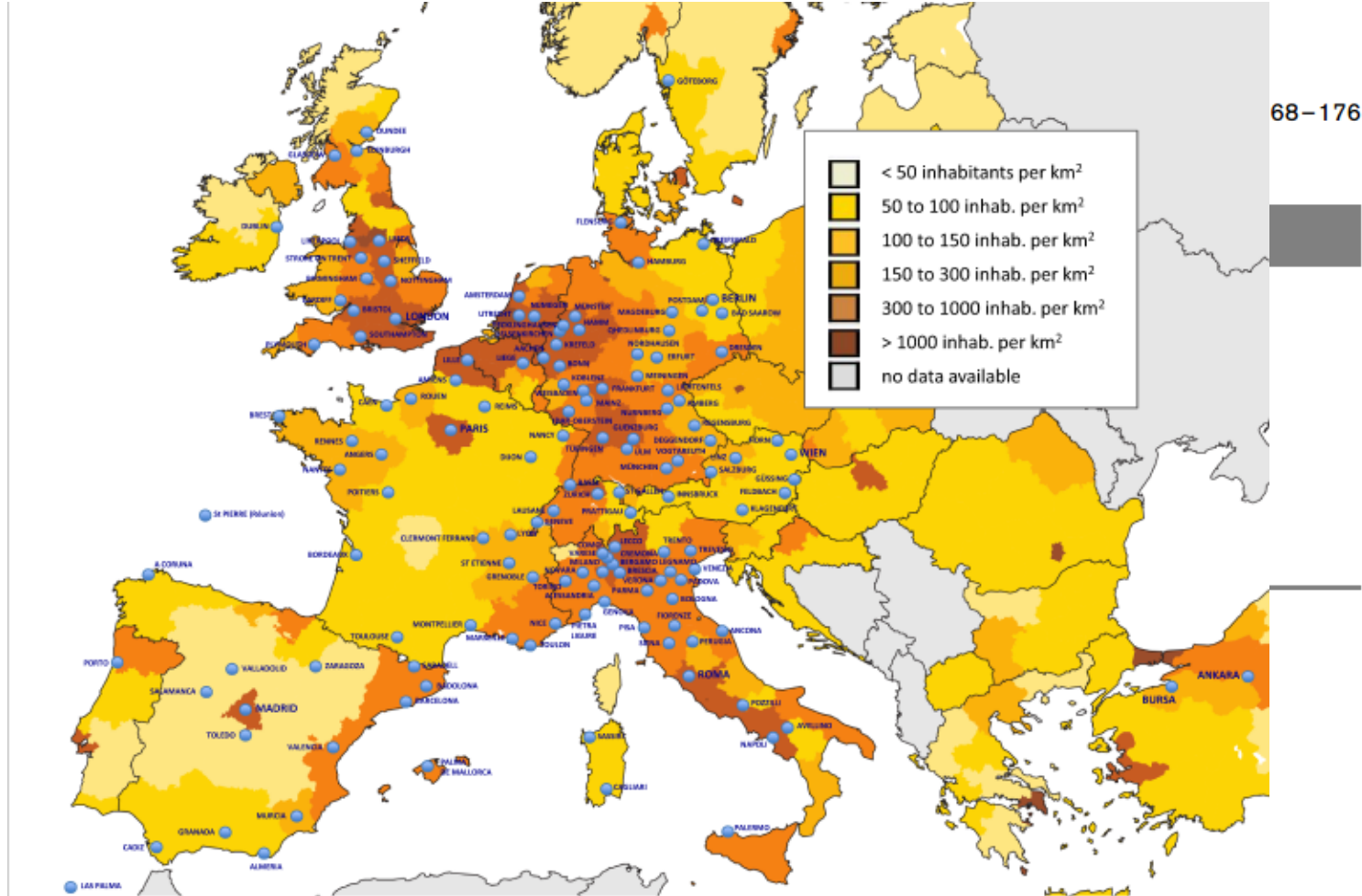
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No true distinction in selection criteria between HF10 and burst stimulation  
22nd January 2016

Novel combination technique prevents distal embolisation during thrombectomy

and that in the majority of neurosurgical units, most of the key

In the majority of neurosurgical units (53% or 16/30), treatment was not instituted to actively reduce blood pressure below a systolic value of 160 mm Hg in patients whose aneurysm had not yet been secured. Only in a minority of units (30% or 9/30) was treatment instigated to reduce blood pressure below this target. The vast majority (87% or 26/30) of UK units did not administer tranexamic acid with the aim of reducing the risk of rebleeding.



268 surveys from 172 distinct institutions in 12 European countries

Cover more than 80% of cities with over 300 000 inhabitants  
 64% of the neurovascular centres identified as taking care of SAH

	Total (n = 268)
Drug(s) used for prevention of vasospasm	
Nimodipine	259 (97)
Statins	55 (20)
Magnesium	52 (19)
Nicardipine if hypertensive	13 (5)
None of the above	8 (3)

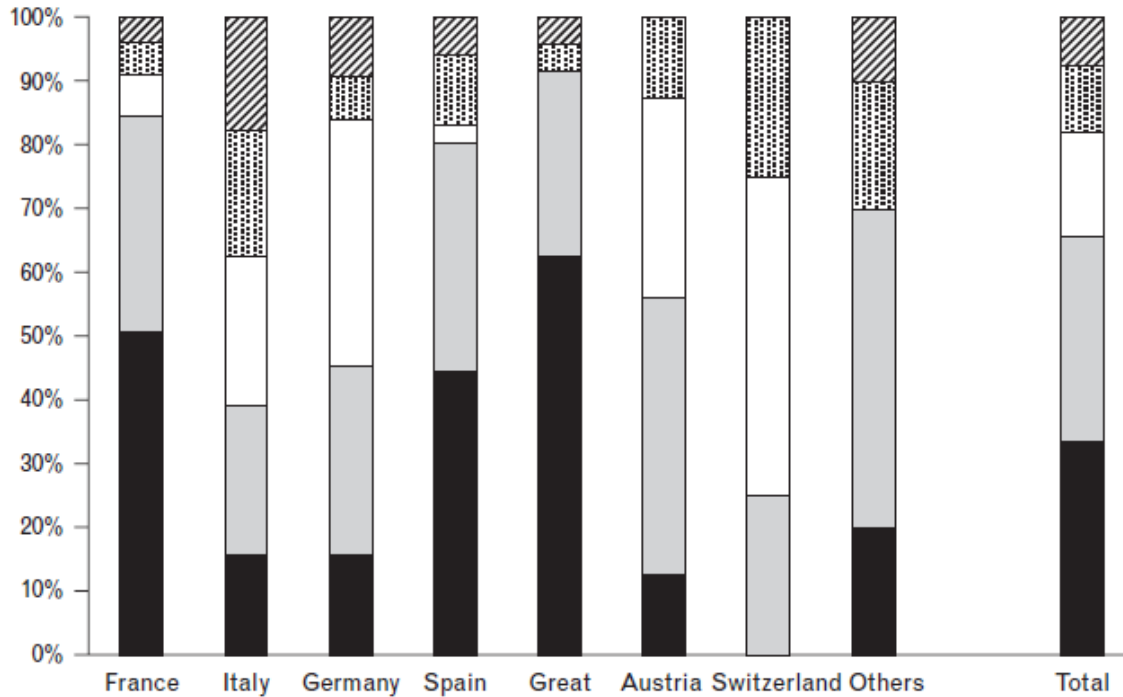
Aneurysm treatment delay	
as soon as possible (including at night)	101 (38)
<24 h after admission	118 (44)
<48 h after admission	40 (15)
<72 h after admission or later	9 (3)

**Total**  
(n = 268)

**Criteria for SAH admission to ICU**

All patients after SAH	193 (72)
Only high-grade patients (WFNS 3 to 5)	75 (28)

agement are summarized in table 2. Patients should be under continuous observation in an intensive care unit, or in an intermediate care facility of a stroke or neurovascular unit [67]. Staff in this unit should have ample experience



**Audibert et al**

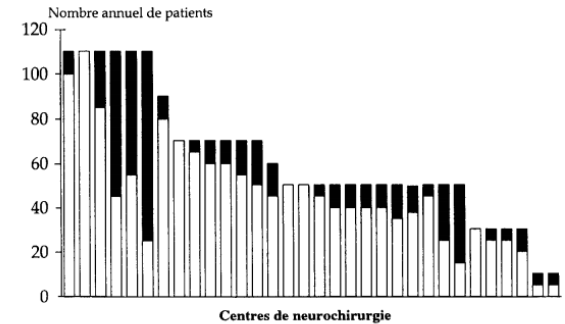
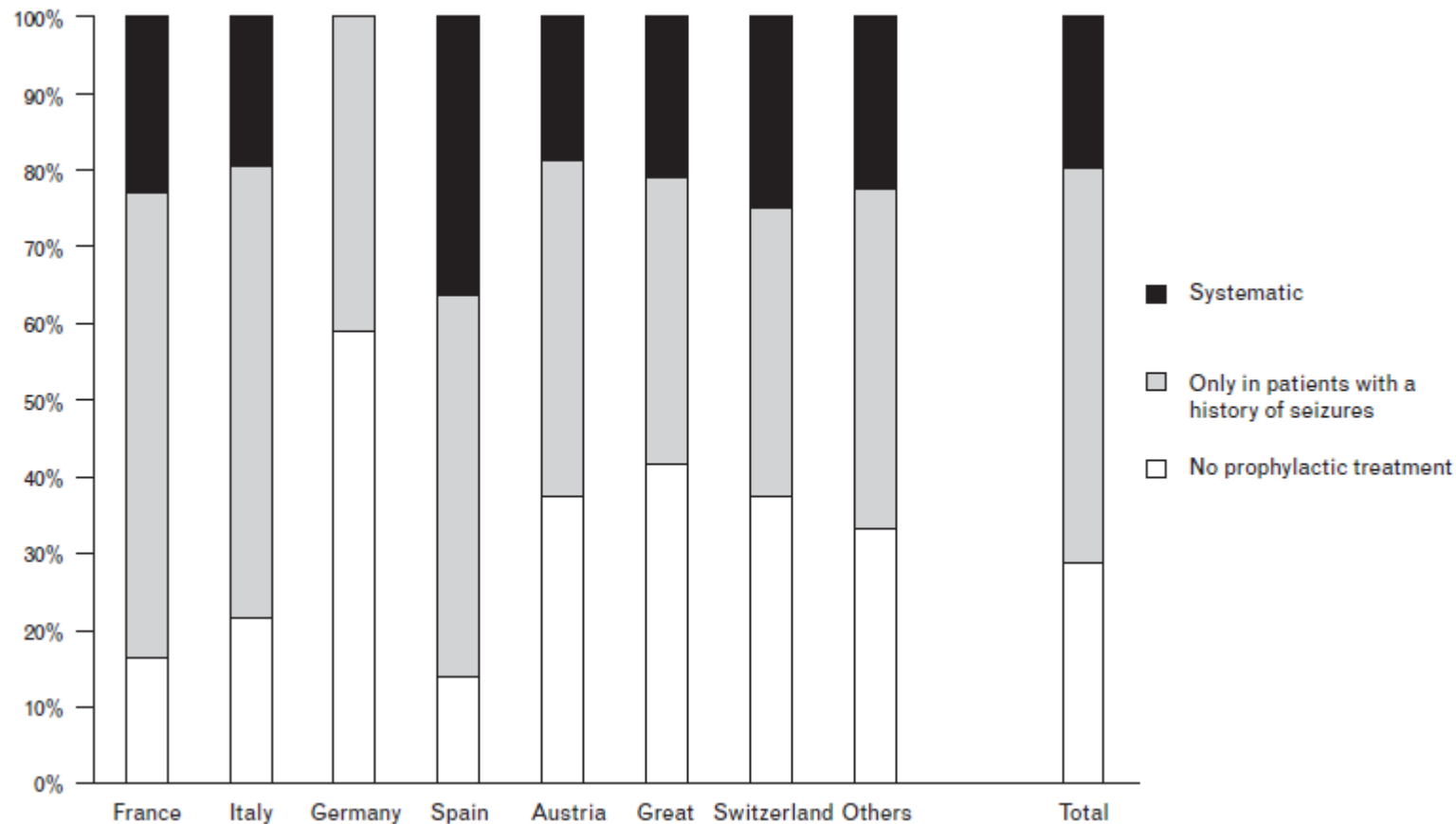


Fig 1. Modalités thérapeutiques des hémorragies sous-arachnoïdiennes dans 32 centres de neurochirurgie ; ■ : traitement endovasculaire ; □ : chirurgie.



### Technique used

'Triple-H' therapy	117 (44)
'Double H' therapy	58 (22)
Hypertension	80 (30)
None of the above	13 (5)

# Perioperative management of patients with acute subarachnoid hemorrhage.

## Do Italians think differently?

P. GRITTI<sup>1</sup>, C. A. CASTIONI<sup>2</sup>, S. CAZZANIGA<sup>3</sup>, F. BILOTTA<sup>4</sup>  
and the NeuroAnesthesia and Neurocritical Care Study Group of SIAARTI

ITEMS	51 Italy N. (%)	217 Europe N. (%)	P-value
What is your clinical practice?			P<0.001
- Both anaesthesia and ICU	25 (49)	95 (44)	
- Mainly anaesthesia	2 (4)	78 (36)	
- Mainly ICU	24 (47)	44 (20)	
Criteria of SAH admission to ICU			P<0.001
- All patients after SAH	24 (47)	169 (78)	
- Only high grade patients (WFNS 3-5)	27 (53)	48 (22)	
Procedure to treat the aneurysm:			P<0.001
- Coiling > 60% and >90%	20 (39)	156 (72)	
- Clipping > 60% and >90%	19 (37)	29 (13)	
- Both	12 (24)	32 (15)	
- other	0	0	
Anaesthetic technique for clipping is mainly:			P=0.025
- Total intravenous anaesthesia	33 (65)	174 (84)	
- Inhalation anaesthesia	18 (35)	43 (21)	
The opioid used:			P<0.001
- Remifentanil	39 (76)	152 (70)	
- Sufentanil	0	52 (24)	
- Fentanyl	12 (24)	13 (6)	
Recovery and tracheal extubation after uncomplicated surgery:			P<0.001
- As soon as possible in most patient	31 (61)	186 (86)	
- After a 1-3 hours delay in the PACU	7 (14)	10 (5)	
- Delayed in the ICU in most patients	13 (25)	21 (10)	
Non clinical diagnosis of vasospasm relies upon:			P=0.009
- Transcranial Doppler	42 (51)	168 (38)	
- CT perfusion	10 (12)	62 (14)	
- CT angiography	10 (12)	101 (23)	
- Conventional angiography	21 (25)	78 (18)	
- Brain tissue oxygen pressure	0	24 (5)	
- None of the above	0	10 (2)	
Interventional management of vasospasm:			P<0.001
- Intra-arterial vasodilator(s) alone	15 (30)	51 (23)	
- Angioplasty alone	0	12 (6)	
- Both methods	14 (27)	119 (55)	
- None of the above	22 (43)	35 (16)	
Main method to increase blood pressure:			P<0.001
- Noradrenaline	41 (80)	110 (50)	
- Ephedrine	1 (2)	45 (21)	
- Dopamine	8 (16)	4 (2)	
- Others	1 (2)	58 (27)	

# Evaluating and planning ICUs: methods and approaches to differentiate between need and demand

Criteria of

- All pa
- Only 1

Claudia Wild<sup>a,\*</sup>, Markus Narath<sup>b</sup>

<sup>a</sup> Institute of Technology Assessment at the Austrian Academy of Sciences,  
Strohgasse 45, A-1030 Vienna, Austria

<sup>b</sup> KAGes/Krankenanstaltenges.m.b.H. Stiftingtalstr. 4-6, A-8036 Graz, Austria

Procedure ICU-beds as percentage of acute hospital beds and per 100,000 inhabitants

- Coilin
- Clippi
- Both

Country	All hospital beds (%)	ICU-beds/100,000 population
United States	6.3	30.5
Germany	2.7	28.6
Austria	3.8	21.0
Spain	3.0	14.8
Japan	2.7	11.8
Italy	1.2	09.4
United Kingdom	2.7	08.6
Australia	—	07.5

- Recovery & uncomplic
- As soc
- After &
- Delaye

Interventio

- Intra-a
- Angioplasty alone
- Both methods
- None of the above

	0	12 (6)	p < 0.001
	14 (27)	119 (55)	
	22 (43)	35 (16)	

.001

.001

.001



## ORIGINAL ARTICLE

**Anaesthetic and ICU management of aneurysmal subarachnoid haemorrhage***A survey of European practice*

Lionel J. Velly, Federico Bilotta, Neus Fàbregas, Martin Soehle, Nicolas J. Bruder, Michael H. Nathanson, for the European Neuroanaesthesia and Critical Care Interest Group (ENIG)

We did not observe any clear improvement from 2006 to 2012 in the variability of practice

**CONCLUSION** We found striking variability in the practice patterns of European physicians involved in early treatment of SAH. Significant differences were noted among countries and between high and low-volume coiling centres.

# Guidelines

**MARSH 1987**

Mayberg MR, Batjer HH, Dacey R, Diringer M, Haley EC, Heros RC, Sternau LL, Torner J, Adams HP Jr, Feinberg W, et al. Guidelines for the management of aneurysmal subarachnoid hemorrhage. A statement for healthcare professionals from a special writing group of the Stroke Council, American Heart Association. Stroke. 1994 Nov;25(11):2315-28. PubMed PMID: 7974568.

**2009**

Bederson JB, Connolly ES Jr, Batjer HH, Dacey RG, Dion JE, Diringer MN, Duldner JE Jr, Harbaugh RE, Patel AB, Rosenwasser RH; American Heart Association. Guidelines for the management of aneurysmal subarachnoid hemorrhage: a statement for healthcare professionals from a special writing group of the Stroke Council, American Heart Association. Stroke. 2009 Mar;40(3):994-1025. doi: 10.1161/STROKEAHA.108.191395. Epub 2009 Jan 22. Review. Erratum in: Stroke

**2012**

Diringer MN, Bleck TP, Claassen JD, Connolly ES Jr, Rabinstein VA, Sheth SG, Sheth SG, et al. Guidelines for the management of aneurysmal subarachnoid hemorrhage: a guideline for the Neurocritical Care Society.

## Variability

## Heterogeneity

## Difference between Practice and Published Evidence

Connolly ES Jr, Rabinstein VA, Connolly ES Jr, et al. Guidelines for the management of aneurysmal subarachnoid hemorrhage: a guideline for the American Stroke Association. Stroke. 2012;43:1711-37.

Steiner T, Juvela S, Unterberg A, Jung C, Forsting M, Rinkel G; European Stroke Organization. European Stroke Organization guidelines for the management of intracranial aneurysms and subarachnoid haemorrhage. Cerebrovasc Dis. 2013;35:93-112.

Jeong HW, Seo JH, Kim ST, Jung CK, Suh SI. Clinical practice guideline for the management of intracranial aneurysms. Neurointervention. 2014 Sep;9(2):63-71. doi: 10.5469/neuroint.2014.9.2.63. Epub 2014 Sep 3. Review. PubMed PMID: 25426300; PubMed Central PMCID

**2015**

**VELLY 2015**

# Surveys

Marsh H, Maurice-Williams RS, Lindsay KW. Differences in the management of ruptured intracranial aneurysms: a survey of practice amongst British neurosurgeons. J Neurol Neurosurg Psychiatry. 1987 Aug;50(8):965-70

**1994**

Audibert G, Pottier JC, Hummer M, Torrens J. Anesthesia and intensive care of subarachnoid hemorrhage. A survey on practice in 32 centres. Ann Fr Anesth Reanim. 1996;15:338-41.

Sakowitz OW, Raabe A, Vucak D, Kiening KL, Unterberg AW. Contemporary management of aneurysmal subarachnoid hemorrhage in Germany: results of a survey among 100 neurosurgical departments. Neurosurgery. 2006 Jan;58:137-45.

**2011**

Stevens RD, Naval NS, Mirski MA, Citerio G, Andrews PJ. Intensive care of aneurysmal subarachnoid hemorrhage: an international survey. Intensive Care Med. 2009;35:1556-66.

Rama-Maceiras P, Fàbregas N, Ingelmo I, Hernández-Palazón J. [Survey of anesthesiologists' practice in treating spontaneous aneurysmal subarachnoid hemorrhage]. Rev Esp Anestesiol Reanim. 2009 Jan;56(1):9-15. Spanish. PubMed PMID: 19284122

Tomycz L, Shekhawat N, Forbes J, Ghiassi M, Ghiassi M, Lockney D, Velez D, Mericle R. The spectrum of management

**2014**

Al-Helli O, Bush S, Ingale H, McConachie N. Management of aneurysmal subarachnoid hemorrhage: a national survey of current practice. J Neurointerv Surg. 2014 Oct 20.

Hollingsworth M, Chen PR, Goddard AJ, Coulthard A, Söderman M, Bulsara KR. Results of an International Survey on the Investigation and Endovascular Management of Cerebral Vasospasm and Delayed Cerebral Ischemia. World Neurosurg. 2015 Feb 11.

Velly LJ, Bilotta F, Fàbregas N, Soehle M, Bruder NJ, Nathanson MH; for the European Neuroanaesthesia and Critical Care Interest Group (ENIG). Anaesthetic and ICU management of aneurysmal subarachnoid haemorrhage: A survey of European practice. Eur J Anaesthesiol. 2015 May 9



- Nevertheless, the fundamental point illustrated by the survey remains: we are currently functioning in an environment dominated by questions and unknowns. Further clinical and translational research is greatly needed to achieve improved standardization of care.

# Rabinstein AA. The AHA Guidelines for the Management of SAH: what we know and so much we need to learn. Neurocrit Care. 2009

- What other mechanisms in addition to vasospasm cause secondary brain damage after SAH?
- Is profound anemia worse than transfusions?
- Are anticonvulsants useful if one avoids phenytoin?
- What is the best timing and method for discontinuation of ventricular drainage in patients with early hydrocephalus?
- What is the best functional outcome endpoint for future studies? Are there reliable surrogate endpoints? Should we standardize functional outcome assessment tools across SAH studies?
- Who should be screened for intracranial aneurysms and how?
- What are the mechanisms of acute brain injury at the time of SAH?
- What would be the most important variables to be incorporated in a tool designed to help paramedics and Emergency Department personnel recognize SAH?
- What constitutes the best emergent care of patients with SAH? For example, what should be the target blood pressure?
- Should SAH care be regionalized?
- What is the true value of newer endovascular techniques (e.g., stent-assisted coiling, bioactive coils)?
- What is the best protocol to monitor coiled aneurysms (how often should angiograms be repeated? for how long? using what imaging technique?)
- Is intraoperative hypothermia actually valuable in certain cases? How about intraoperative induced hypertension?
- What is the added value of caring for these patients in a neurological ICU and what are the practices which afford greater benefit?
- Is outcome improved by using standardized protocols for SAH care?
- What is the value of invasive multi-modality brain monitoring in poor-grade patients?
- What is the role of newer diagnostic techniques (e.g., CT perfusion, vasoreactivity studies, brain tissue oxygen probes) for the timely detection of vasospasm and cerebral hypoperfusion?
- What is the value of novel treatment strategies for the prevention of delayed ischemia (e.g., endothelin antagonists, statins, magnesium, lumbar drainage, prophylactic angioplasty, nitric oxide donors)?
- What is the best way to implement hemodynamic augmentation?
- What is the value of albumin in SAH?
- Should poor-grade patients be kept hypothermic?

# Controversies in the management of aneurysmal subarachnoid hemorrhage\*

Neeraj S. Naval, MD; Robert D. Stevens, MD; Marek A. Mirski, MD, PhD; Anish Bhardwaj, MD, FCCM

**M**any aspects of care in patients with aneurysmal subarachnoid hemorrhage remain highly controversial and warrant further resolution with hypothesis-driven clinical or translational research.

Table 1. Summary of controversies in the management of aneurysmal subarachnoid hemorrhage (SAH)

Controversy	Best Available Evidence and Recommendations	Future Studies
Surgical vs. endovascular aneurysm exclusion	Level I evidence in favor of endovascular management (grade A)	Comparative long-term follow-up of endovascular vs. surgical patients. New randomized trials to test endovascular vs. surgical therapy in patient subsets that were not represented in the ISAT trial.
Diagnosis of vasospasm Transcranial Doppler (TCD)	Level III evidence for high PPV and specificity of TCD for MCA (grade C)	Prospective study comparing predictive value of CTA and TCD with angiography in detecting vasospasm.
Computerized tomography angiography (CTA)	Level III comparing CTA to angiography and TCD (grade C)	Observational study to compare CTACT perfusion, perfusion-weighted MRI, and conventional angiography in detecting clinically significant vasospasm.
MRI, PET, SPECT Cerebral microdialysis	Level V evidence (grade C) Level V evidence	Prospective clinical studies to understand the correlation between neurochemical abnormalities and clinical events in SAH. Outcome-based trials to assess the effect of microdialysis-guided management.
Treatment of vasospasm Vasospasm prophylaxis	Level II evidence showing no effect of triple-H prophylaxis on DIND (grade B)	Prospective randomized study comparing outcomes in patients in vasospasm receiving either triple-H therapy or undergoing immediate endovascular intervention. Prospective studies to identify high-risk patients who may be candidates for prophylactic management of vasospasm.
Vasospasm treatment	Level III evidence supporting use of hemodynamic augmentation as treatment of vasospasm (grade C)	Adequately powered prospective, randomized trial evaluating hemodynamic augmentation vs. conventional hemodynamic goals in symptomatic vasospasm. Prospective, randomized trials to compare a strategy of cardiac output augmentation vs. arterial pressure augmentation.
Hemodynamic end points	Level IV evidence for use of cardiac output goals over arterial pressure goals for hemodynamic augmentation (grade C)	
Intra-aortic balloon counterpulsation (IABC) Neuroprotection Ca <sup>2+</sup> channel blockers	Level IV evidence for use of IABC Level I evidence favoring use of nimodipine and against use of nicardipine and ATR77 (grade A)	Search for alternative neuroprotectants based on animal studies for possible synergy with or superiority to nimodipine.
Tirilizad mesylate	Level II evidence in favor of tirilizad for high grade SAH (grade A)	
Glucocorticoids, magnesium, endothelin receptor antagonists, and hydroxymethylglutaryl coenzyme A reductase inhibitors	Level II evidence for statins, magnesium (grade B)	Randomized, placebo-controlled study of these agents in patients with aneurysmal SAH; larger randomized trials evaluating statins and magnesium in SAH.
Hypothermia	Level V evidence favoring use of other agents (grade C) Level I evidence showing no benefit of intraoperative hypothermia (grade A); use in other settings unclear	Prospective, randomized studies to define the role of hypothermia in patients at high risk to develop vasospasm (prophylaxis) or in patients with clinical vasospasm.
Thrombolytics	Level II* evidence for use of thrombolytics (grade B)	Prospective, randomized trials with sufficient statistical power to detect the efficacy of antiplatelet agents, anticoagulants, and intraoperative thrombolytics with appropriate end points (recurrent hemorrhage, DIND, mortality, and morbidity/functional outcome).
Anticoagulation Antiplatelet agents	Level II* evidence in favor of use of antiplatelet agents (grade B)	
Seizure prophylaxis	Level V evidence in favor of prophylaxis	Randomized, placebo-controlled studies of anticonvulsants in aneurysmal SAH with risk stratification based on grade of SAH, location of aneurysm, and surgical intervention (craniotomy).
Cardiac sequelae of SAH Myocardial dysfunction	Level III evidence against prophylaxis (grade C) Level III evidence in favor of adrenergic receptor blockade Level IV evidence in favor of inotropic support or IABC	Prospective, observational studies to identify pathophysiology, diagnosis, management, and outcome of neurocardiogenic injury and to distinguish from other forms of myocardial dysfunction.

Guidelines for the Management of Aneurysmal Subarachnoid Hemorrhage

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

The American Academy of Neurology affirms the value of this statement as an educational tool for neurologists.

2012

Although these data show that frequent revision of these guidelines is clearly needed, the data presented here only begin to scratch the surface of the burgeoning knowledge in this fast-developing field.

neurocritical care society Neurocrit Care (2011) 15:211–240 DOI 10.1007/s12028-011-9605-9

REVIEW

Critical Care Management of Subarachnoid Hemorrhage: Review of the Neurocritical Care Society’s Multidisciplinary Consensus Conference

Michael N. Diringer · Thomas P. Bleck · J. Clat Paul Vespa · Nicolas Bruder · E. Sander Connolly · Daniel Hänggi · Brian L. Hoh · Giuseppe Lanzini · Erich Schmutzhard · Nino Stocchetti · Jose I. Sistiervyn D. I. Vergouwen · Stefan Wolf · Gregor

- Routine use of anticonvulsant prophylaxis with phenytoin is not recommended after SAH (low quality evidence—strong recommendation).
- Routine use of other anticonvulsants for prophylaxis may be considered (very low quality evidence—weak recommendation).
- If anticonvulsant prophylaxis is used, a short course (3–7 days) is recommended (low quality evidence—weak recommendation).
- Hypothalamic dysfunction should be considered in patients who are unresponsive to vasopressors. The optimal method of diagnosis remains unclear (moderate quality evidence—weak recommendation).
- Administration of high dose corticosteroids is not recommended in acute SAH (high quality evidence—weak recommendation)
- Hormonal replacement with mineralocorticoids should be considered in acute SAH to prevent hypovolemia and hyponatremia (moderate quality evidence—weak recommendation).
- Hormonal replacement with stress-dose corticosteroids for patients with vasospasm and unresponsiveness to induced hypertension may be considered (weak quality evidence—weak recommendation).
- Treat extreme hypertension in patients with an unsecured, recently ruptured aneurysm. Modest elevations in blood pressure (mean blood pressure <110 mmHg) do not require therapy. Pre-morbid baseline blood pressures should be used to refine targets; hypotension should be avoided (Low Quality Evidence; Strong Recommendation).

Cerebrovascular Diseases

Guidelines

Cerebrovasc Dis 2013;35:93–112 DOI: 10.1159/000346087

Received: October 9, 2012 Accepted: November 22, 2012 Published online: February 7, 2013

Recommendation for Seizure Management

- Antiepileptic treatment should be administered in patients with clinically apparent seizures (GCP)
- There is no evidence that supports the prophylactic use of antiepileptic drugs (class IV, level C)

Guidelines for Aneurysms

and Subarachnoid Haemorrhage

Thorsten Steiner<sup>a</sup> Seppo Juvela<sup>d</sup> Andreas Unterberg<sup>b</sup> Carla Jung<sup>b</sup> Michael Forstina<sup>c</sup> Gabriel Rinkel<sup>e</sup>

Statement on the Use of Steroids

- There is no proof that steroids are effective in patients with SAH (class IV, level C)

<sup>a</sup>University, Heidelberg, and <sup>d</sup>Department of Clinical Neurosciences, University of Helsinki, <sup>f</sup>Trecht, The Netherlands

Recommendation for Blood Pressure Management

- Until coiling or clipping, systolic blood pressure should be kept below 180 mm Hg; this may be already achieved by applying analgetics and nimodipine (GCP)

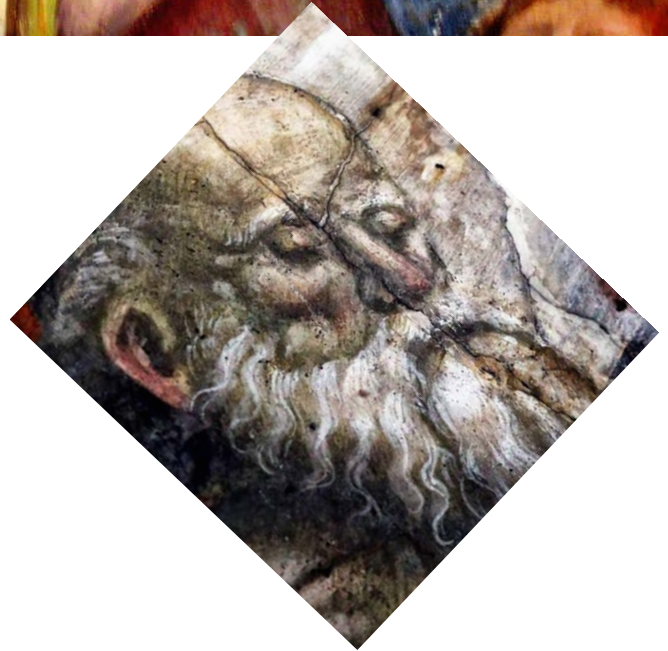
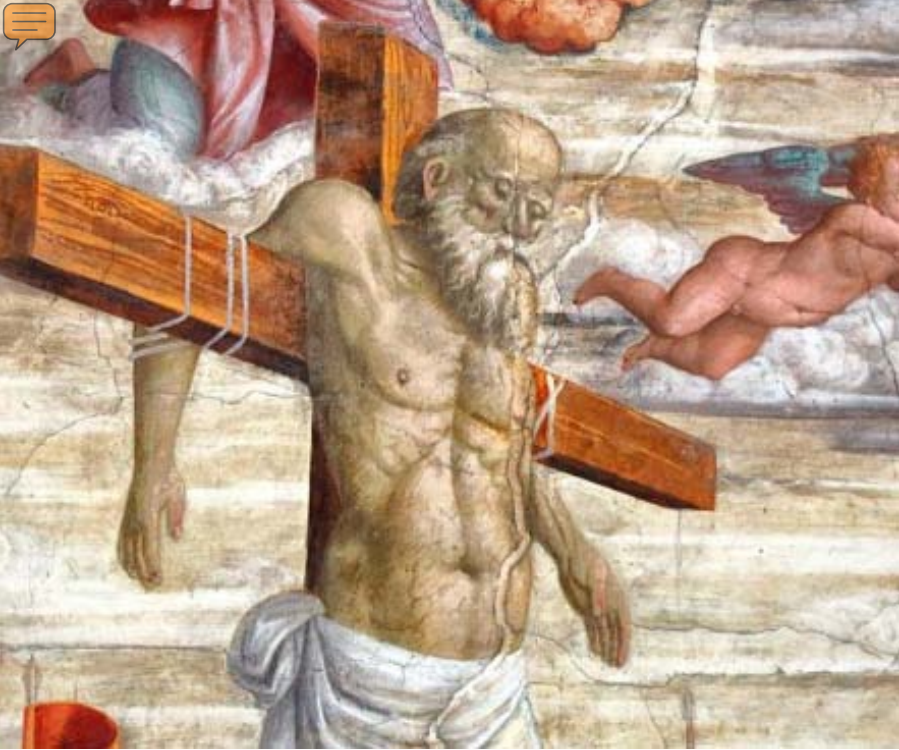


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Conversione di Saulo

Merisi nella bottega del Peterzano

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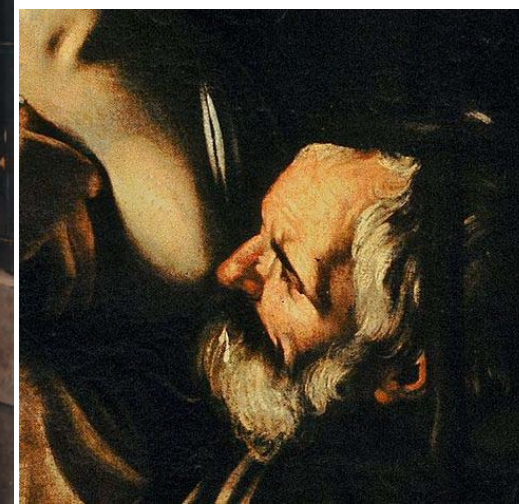
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Pio Monte della  
Misericordia,  
Napoli

# Perioperative management of patients with acute subarachnoid hemorrhage.

## Do Italians think differently?

P. GRITTI<sup>1</sup>, C. A. CASTIONI<sup>2</sup>, S. CAZZANIGA<sup>3</sup>, F. BILOTTA<sup>4\*</sup>

These differences raise some questions. Do we think differently about SAH management because the different resources available in each country or due to the peculiarity of this complex multifaceted pathology and the lack of proven intervention in the treatment of SAH of ruptured intracranial aneurysm? Then again, do we think differently because of a low adherence to available guidelines?

However, if we need to wait for a prospective study that could answer the last questions perhaps further considerations could be obtained by a study of the respondents' variability.

# Accordo (test k ) negli items in base ad argomento: Fleiss's Kappa

## Interpretation of Kappa



Poor    Slight    Fair    Moderate    Substantial    Almost perfect



Kappa    0.0    .20    .40    .60    .80    1.0

<u>Kappa</u>	<u>Agreement</u>
< 0	Less than chance agreement
0.01–0.20	Slight agreement
0.21– 0.40	Fair agreement
0.41–0.60	Moderate agreement
0.61–0.80	Substantial agreement
0.81–0.99	Almost perfect agreement

Generalmente si sceglie almeno  $k > 0.6$  come target di agreement per definire uno standard.

- 1 Cohen, J. A coefficient of agreement for nominal scales. Educational and Psychological Measurement 1960;20: 37–46.
- 2 Landis JR, Koch GG. The measurement of observer agreement for categorical data Biometrics 1977: 33; 159–174.
- 3 Natarajan S, McHenry MB, Lipsitz S, Klar N, Lipshultz S. A greement Between Two Ratings with Different Ordinal Scales. In: Auget JL, Balakrishnan N, Mesbah M, Molenberghs G, editors. Advances in Statistical Methods for the Health Sciences Statistics for Industry and Technology. Birkhauser: Springer; 2007. p 139-148.

# Cohen's Kappa

$$\kappa = \frac{\Pr(a) - \Pr(e)}{1 - \Pr(e)},$$

# Fleiss's Kappa

$$\kappa = \frac{\bar{P} - \bar{P}_e}{1 - \bar{P}_e}$$

Fleiss JL. Measuring nominal scale agreement among many raters. *Psychological Bulletin* 1971;76: 378–382.

Cohen, J. A coefficient of agreement for nominal scales. *Educational and Psychological Measurement* 1960;20: 37–46.

Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics* 1977; 33; 159–174.

$$p_j = \frac{1}{Nn} \sum_{i=1}^N n_{ij}, \quad 1 = \frac{1}{n} \sum_{j=1}^k n_{ij}$$

$$P_i = \frac{1}{n(n-1)} \sum_{j=1}^k n_{ij}(n_{ij} - 1)$$

$$\begin{aligned} P_i &= \frac{1}{n(n-1)} \sum_{j=1}^k (n_{ij}^2 - n_{ij}) \\ &= \frac{1}{n(n-1)} \left[ \left( \sum_{j=1}^k n_{ij}^2 \right) - (n) \right] \end{aligned}$$

$$\bar{P} = \frac{1}{N} \sum_{i=1}^N P_i$$

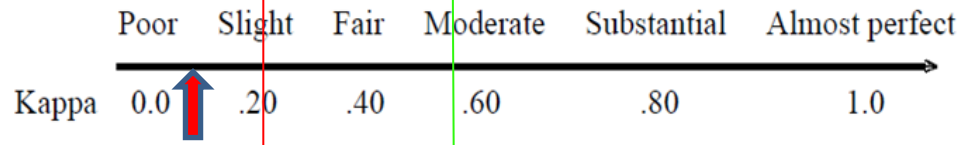
$$= \frac{1}{Nn(n-1)} \left( \sum_{i=1}^N \sum_{j=1}^k n_{ij}^2 - Nn \right)$$

$$\bar{P}_e = \sum_{j=1}^k p_j^2$$



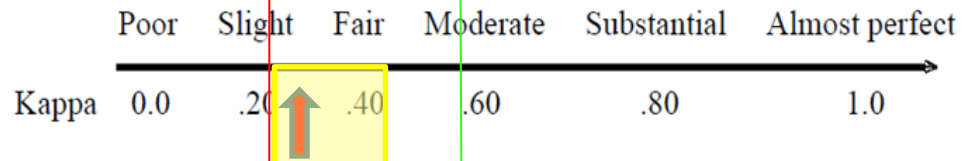
### General management of patients with subarachnoid haemorrhage:

kappa = 0.047 (95% CI, 0.041 to 0.052)



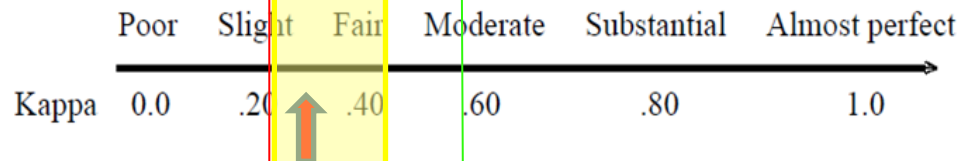
### Anesthetic management for patients undergoing CLIPPING:

kappa = 0.273 (95% CI, 0.270 to 0.276)



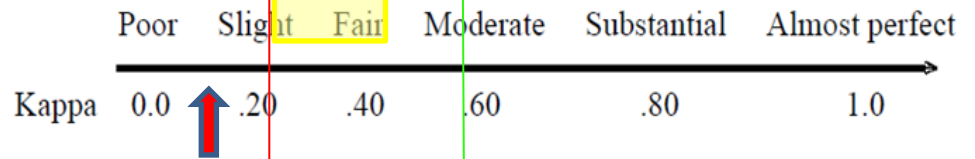
### Anesthetic management for patients undergoing COILING:

kappa = 0.287 (95% CI, 0.284 to 0.291)



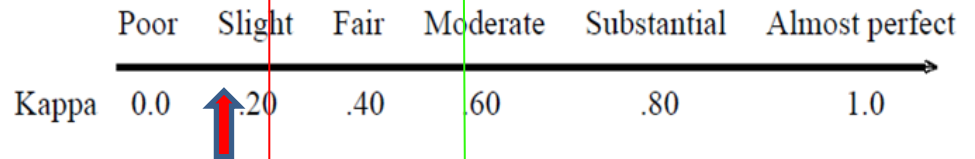
### Postoperative Care:

kappa = 0.135 (95% CI, 0.130 to 0.139)



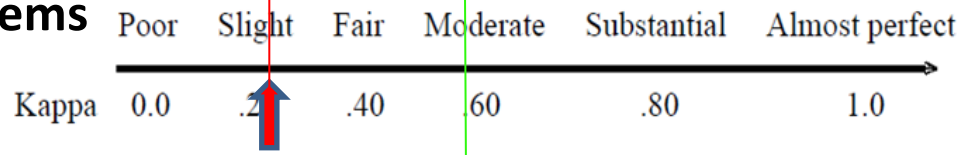
### Management of Cerebral Vasospasm:

kappa = 0.177 (95% CI, 0.175 to 0.180)



### Accordo globale di tutti i precedenti items

kappa = 0.229 (95% CI, 0.228 to 0.231)



# Perioperative Management of patients with Acute Subarachnoid Hemorrhage. Do Italians Think differently?





**FIGURE 1** Brennan-Prediger modified kappa

$$A) \quad k = \frac{\bar{P}_a - \bar{P}_e}{1 - \bar{P}_e}$$

$$B) \quad \bar{P}_e = \frac{\sum_{i=1}^n \frac{1}{q_i}}{n}$$

A) The agreement among responders regarding questionnaire items was assessed based on a modified version of Brennan-Prediger kappa ( $k$ ) where  $\bar{P}_a$  is the pooled (fixed-effect) estimate of all pairwise proportions of agreement and  $\bar{P}_e$  the pooled estimate of chance agreement as defined in 2.

B) Arithmetic mean of probabilities of chance agreement for each variable, where  $q_i$  is the number of categories composing each variable investigated.

**I Paesi che presentano la maggior percentuale di protocolli sono anche quelli con minor eterogeneità**  
**Overall and subgroup agreement by country stratified according to the presence of anaesthetic protocols for clipping and coiling**

Section	Austria	France	Germany	Italy	Spain	Switzerland	UK	H
Presence of a protocol (n/total,%)	3/16 (18.7%)	18/79 (22.8%)	23/44 (52.3%)	14/51 (27.4%)	11/36 (30.6%)	3/8 (37.5%)	3/24 (12.5%)	
General management of SAH	0.300 (0.230, 0.371)	0.243 (0.229, 0.257)	0.191 (0.168, 0.216)	0.134 (0.114, 0.154)	0.152 (0.124, 0.182)	0.267 (0.125, 0.415)	0.257 (0.211, 0.303)	4.14
Protocol: No	0.314 (0.227, 0.402)	0.235 (0.217, 0.253)	0.147 (0.098, 0.197)	0.167 (0.139, 0.196)	0.143 (0.102, 0.186)	0.375 (0.127, 0.623)	0.273 (0.220, 0.326)	
Protocol: Yes	0.597 (0.101, 0.970)	0.247 (0.186, 0.309)	0.225 (0.178, 0.273)	0.072 (0.003, 0.146)	0.150 (0.056, 0.251)	0.153 (-0.220, 0.649)	0.153 (-0.220, 0.649)	
P-value	0.26	0.71	0.03	0.02	0.88	0.44	0.67	
Anaesthetic management for clipping	0.377 (0.325, 0.429)	0.321 (0.311, 0.331)	0.422 (0.404, 0.441)	0.211 (0.195, 0.226)	0.341 (0.318, 0.363)	0.381 (0.273, 0.487)	0.324 (0.288, 0.360)	7.21
Protocol: No	0.351 (0.286, 0.415)	0.316 (0.303, 0.329)	0.397 (0.358, 0.435)	0.180 (0.159, 0.202)	0.334 (0.301, 0.366)	0.370 (0.188, 0.548)	0.367 (0.326, 0.408)	
Protocol: Yes	0.362 (0.024, 0.691)	0.324 (0.279, 0.370)	0.437 (0.402, 0.472)	0.307 (0.248, 0.367)	0.342 (0.265, 0.418)	0.443 (0.100, 0.758)	0.362 (0.024, 0.691)	
P-value	0.96	0.73	0.13	<0.001	0.85	0.72	0.97	
Anaesthetic management for coiling	0.395 (0.338, 0.452)	0.278 (0.267, 0.289)	0.423 (0.403, 0.443)	0.209 (0.192, 0.226)	0.299 (0.274, 0.324)	0.376 (0.257, 0.494)	0.260 (0.222, 0.298)	6.67
Protocol: No	0.351 (0.279, 0.422)	0.283 (0.269, 0.298)	0.409 (0.366, 0.452)	0.172 (0.148, 0.196)	0.374 (0.338, 0.411)	0.348 (0.146, 0.547)	0.297 (0.254, 0.341)	
Protocol: Yes	0.618 (0.237, 0.913)	0.239 (0.188, 0.290)	0.421 (0.382, 0.460)	0.324 (0.258, 0.390)	0.149 (0.068, 0.233)	0.421 (0.038, 0.775)	0.115 (-0.213, 0.501)	
P-value	0.18	0.10	0.68	<0.001	<0.001	0.75	0.36	
Postoperative Care	0.184 (0.120, 0.248)	0.231 (0.218, 0.243)	0.399 (0.376, 0.421)	0.079 (0.060, 0.098)	0.247 (0.219, 0.275)	0.232 (0.099, 0.365)	0.273 (0.231, 0.315)	8.67
Protocol: No	0.209 (0.130, 0.289)	0.225 (0.209, 0.242)	0.420 (0.373, 0.467)	0.052 (0.026, 0.078)	0.239 (0.199, 0.280)	0.090 (-0.123, 0.316)	0.282 (0.234, 0.330)	
Protocol: Yes	0.014 (-0.352, 0.444)	0.225 (0.168, 0.281)	0.408 (0.365, 0.451)	0.276 (0.202, 0.349)	0.269 (0.174, 0.363)	0.535 (0.107, 0.878)	0.126 (-0.268, 0.553)	
P-value	0.39	0.98	0.72	<0.001	0.57	0.07	0.48	
Management of Cerebral Vasospasm	0.263 (0.226, 0.299)	0.285 (0.278, 0.293)	0.310 (0.297, 0.323)	0.266 (0.255, 0.277)	0.350 (0.334, 0.366)	0.383 (0.306, 0.460)	0.301 (0.276, 0.325)	3.85
Protocol: No	0.252 (0.208, 0.298)	0.290 (0.280, 0.299)	0.332 (0.304, 0.360)	0.270 (0.254, 0.285)	0.353 (0.330, 0.377)	0.435 (0.304, 0.563)	0.300 (0.272, 0.328)	
Protocol: Yes	0.396 (0.157, 0.634)	0.293 (0.261, 0.326)	0.318 (0.293, 0.343)	0.238 (0.197, 0.280)	0.363 (0.309, 0.419)	0.249 (0.028, 0.492)	0.252 (0.030, 0.495)	
P-value	0.24	0.84	0.46	0.17	0.74	0.19	0.72	
<b>Overall</b>	<b>0.299 (0.275, 0.323)</b>	<b>0.278 (0.273, 0.282)</b>	<b>0.356 (0.347, 0.364)</b>	<b>0.201 (0.194, 0.209)</b>	<b>0.304 (0.293, 0.315)</b>	<b>0.347 (0.297, 0.397)</b>	<b>0.288 (0.271, 0.304)</b>	<b>11.25</b>
Protocol: No	0.287 (0.257, 0.317)	0.277 (0.271, 0.284)	0.355 (0.337, 0.374)	0.189 (0.179, 0.199)	0.313 (0.298, 0.329)	0.352 (0.267, 0.436)	0.305 (0.287, 0.324)	
Protocol: Yes	0.387 (0.232, 0.540)	0.274 (0.252, 0.295)	0.368 (0.351, 0.384)	0.257 (0.230, 0.285)	0.291 (0.255, 0.326)	0.350 (0.195, 0.504)	0.219 (0.070, 0.375)	
P-value	0.21	0.74	0.34	<0.001	0.25	0.98	0.28	

# I gruppi che adottano un protocollo di gestione anestesiológica sono anche quelli che presentano minor eterogeneità

Section	Austria	France	Germany	Italy	Spain	Switzerland	UK	H
Presence of a protocol (n/total,%)	3/16 (18.7%)	18/79 (22.8%)	23/44 (52.3%)	14/51 (27.4%)	11/36 (30.6%)	3/8 (37.5%)	3/24 (12.5%)	
General management of SAH	0.300 (0.230, 0.371)	0.243 (0.229, 0.257)	0.191 (0.168, 0.216)	0.134 (0.114, 0.154)	0.152 (0.124, 0.182)	0.267 (0.125, 0.415)	0.257 (0.211, 0.303)	4.14
Protocol: No	0.314 (0.227, 0.402)	0.235 (0.217, 0.253)	0.147 (0.098, 0.197)	0.167 (0.139, 0.196)	0.143 (0.102, 0.186)	0.375 (0.127, 0.623)	0.273 (0.220, 0.326)	
Protocol: Yes	0.597 (0.101, 0.970)	0.247 (0.186, 0.309)	0.225 (0.178, 0.273)	0.072 (0.003, 0.146)	0.150 (0.056, 0.251)	0.153 (-0.220, 0.649)	0.153 (-0.220, 0.649)	
P-value	0.26	0.71	0.03	0.02	0.88	0.44	0.67	
Anaesthetic management for clipping	0.377 (0.325, 0.429)	0.321 (0.311, 0.331)	0.422 (0.404, 0.441)	0.211 (0.195, 0.226)	0.341 (0.318, 0.363)	0.381 (0.273, 0.487)	0.324 (0.288, 0.360)	7.21
Protocol: No	0.351 (0.286, 0.415)	0.316 (0.303, 0.329)	0.397 (0.358, 0.435)	0.180 (0.159, 0.202)	0.334 (0.301, 0.366)	0.370 (0.188, 0.548)	0.367 (0.326, 0.408)	
Protocol: Yes	<u>0.362 (0.024, 0.691)</u>	<u>0.324 (0.279, 0.370)</u>	<u>0.437 (0.402, 0.472)</u>	<u>0.307 (0.248, 0.367)</u>	<u>0.342 (0.265, 0.418)</u>	<u>0.443 (0.100, 0.758)</u>	0.362 (0.024, 0.691)	
P-value	0.50	0.73	0.13	<0.001	0.03	0.72	0.97	
Anaesthetic management for coiling	0.395 (0.338, 0.452)	0.278 (0.267, 0.289)	0.423 (0.403, 0.443)	0.209 (0.192, 0.226)	0.299 (0.274, 0.324)	0.376 (0.257, 0.494)	0.260 (0.222, 0.298)	6.67
Protocol: No	0.351 (0.279, 0.422)	0.283 (0.269, 0.298)	0.409 (0.366, 0.452)	0.172 (0.148, 0.196)	0.374 (0.338, 0.411)	0.348 (0.146, 0.547)	0.297 (0.254, 0.341)	
Protocol: Yes	<u>0.618 (0.237, 0.913)</u>	0.239 (0.188, 0.290)	<u>0.421 (0.382, 0.460)</u>	<u>0.324 (0.258, 0.390)</u>	0.149 (0.068, 0.233)	<u>0.421 (0.038, 0.775)</u>	0.115 (-0.213, 0.501)	
P-value	0.10	0.10	0.000	0.000	<0.001	0.73	0.36	
Postoperative Care	0.184 (0.120, 0.248)	0.231 (0.218, 0.243)	0.399 (0.376, 0.421)	0.079 (0.060, 0.098)	0.247 (0.219, 0.275)	0.232 (0.099, 0.365)	0.273 (0.231, 0.315)	8.67
Protocol: No	0.209 (0.130, 0.289)	0.225 (0.209, 0.242)	0.420 (0.373, 0.467)	0.052 (0.026, 0.078)	0.239 (0.199, 0.280)	0.090 (-0.123, 0.316)	0.282 (0.234, 0.330)	
Protocol: Yes	0.014 (-0.352, 0.444)	0.225 (0.168, 0.281)	0.408 (0.365, 0.451)	0.276 (0.202, 0.349)	0.269 (0.174, 0.363)	0.535 (0.107, 0.878)	0.126 (-0.268, 0.553)	
P-value	0.39	0.98	0.72	<0.001	0.57	0.07	0.48	
Management of Cerebral Vasospasm	0.263 (0.226, 0.299)	0.285 (0.278, 0.293)	0.310 (0.297, 0.323)	0.266 (0.255, 0.277)	0.350 (0.334, 0.366)	0.383 (0.306, 0.460)	0.301 (0.276, 0.325)	3.85
Protocol: No	0.252 (0.208, 0.298)	0.290 (0.280, 0.299)	0.332 (0.304, 0.360)	0.270 (0.254, 0.285)	0.353 (0.330, 0.377)	0.435 (0.304, 0.563)	0.300 (0.272, 0.328)	
Protocol: Yes	0.396 (0.157, 0.634)	0.293 (0.261, 0.326)	0.318 (0.293, 0.343)	0.238 (0.197, 0.280)	0.363 (0.309, 0.419)	0.249 (0.028, 0.492)	0.252 (0.030, 0.495)	
P-value	0.24	0.84	0.46	0.17	0.74	0.19	0.72	
<b>Overall</b>	<b>0.299 (0.275, 0.323)</b>	<b>0.278 (0.273, 0.282)</b>	<b>0.356 (0.347, 0.364)</b>	<b>0.201 (0.194, 0.209)</b>	<b>0.304 (0.293, 0.315)</b>	<b>0.347 (0.297, 0.397)</b>	<b>0.288 (0.271, 0.304)</b>	<b>11.25</b>
Protocol: No	0.287 (0.257, 0.317)	0.277 (0.271, 0.284)	0.355 (0.337, 0.374)	0.189 (0.179, 0.199)	0.313 (0.298, 0.329)	0.352 (0.267, 0.436)	0.305 (0.287, 0.324)	
Protocol: Yes	0.387 (0.232, 0.540)	0.274 (0.252, 0.295)	0.368 (0.351, 0.384)	0.257 (0.230, 0.285)	0.291 (0.255, 0.326)	0.350 (0.195, 0.504)	0.219 (0.070, 0.375)	
P-value	0.21	0.74	0.34	<0.001	0.25	0.98	0.28	

# In alcuni di questi casi, tra cui l'Italia esiste una differenza statisticamente significativa di omogeneità di trattamento in chi utilizza un protocollo

Section	Austria	France	Germany	Country Italy	Spain	Switzerland	UK	H
Presence of a protocol (n/total,%)	3/16 (18.7%)	18/79 (22.8%)	23/44 (52.3%)	14/51 (27.4%)	11/36 (30.6%)	3/8 (37.5%)	3/24 (12.5%)	
General management of SAH	0.300 (0.230, 0.371)	0.243 (0.229, 0.257)	0.191 (0.168, 0.216)	0.134 (0.114, 0.154)	0.152 (0.124, 0.182)	0.267 (0.125, 0.415)	0.257 (0.211, 0.303)	4.14
Protocol: No	0.314 (0.227, 0.402)	0.235 (0.217, 0.253)	0.147 (0.098, 0.197)	0.167 (0.139, 0.196)	0.143 (0.102, 0.186)	0.375 (0.127, 0.623)	0.273 (0.220, 0.326)	
Protocol: Yes	0.597 (0.101, 0.970)	0.247 (0.186, 0.309)	0.225 (0.178, 0.273)	0.072 (0.003, 0.146)	0.150 (0.056, 0.251)	0.153 (-0.220, 0.649)	0.153 (-0.220, 0.649)	
P-value	0.26	0.71	0.03	0.02	0.88	0.44	0.67	
Anaesthetic management for clipping	0.377 (0.325, 0.429)	0.321 (0.311, 0.331)	0.422 (0.404, 0.441)	0.211 (0.195, 0.226)	0.341 (0.318, 0.363)	0.381 (0.273, 0.487)	0.324 (0.288, 0.360)	7.21
Protocol: No	0.351 (0.286, 0.415)	0.316 (0.303, 0.329)	0.397 (0.358, 0.435)	0.180 (0.159, 0.202)	0.334 (0.301, 0.366)	0.370 (0.188, 0.548)	0.367 (0.326, 0.408)	
Protocol: Yes	0.362 (0.024, 0.691)	0.324 (0.279, 0.370)	0.437 (0.402, 0.472)	0.307 (0.248, 0.367)	0.342 (0.265, 0.418)	0.443 (0.100, 0.758)	0.362 (0.024, 0.691)	
P-value	0.96	0.73	0.13	<0.001	0.85	0.72	0.97	
Anaesthetic management for coiling	0.395 (0.338, 0.452)	0.278 (0.267, 0.289)	0.423 (0.403, 0.443)	0.209 (0.192, 0.226)	0.299 (0.274, 0.324)	0.376 (0.257, 0.494)	0.260 (0.222, 0.298)	6.67
Protocol: No	0.351 (0.279, 0.422)	0.283 (0.269, 0.298)	0.409 (0.366, 0.452)	0.172 (0.148, 0.196)	0.374 (0.338, 0.411)	0.348 (0.146, 0.547)	0.297 (0.254, 0.341)	
Protocol: Yes	0.618 (0.237, 0.913)	0.239 (0.188, 0.290)	0.421 (0.382, 0.460)	0.324 (0.258, 0.390)	0.149 (0.068, 0.233)	0.421 (0.038, 0.775)	0.115 (-0.213, 0.501)	
P-value	0.18	0.10	0.68	<0.001	<0.001	0.75	0.36	
Postoperative Care	0.184 (0.120, 0.248)	0.231 (0.218, 0.243)	0.399 (0.376, 0.421)	0.079 (0.060, 0.098)	0.247 (0.219, 0.275)	0.232 (0.099, 0.365)	0.273 (0.231, 0.315)	8.67
Protocol: No	0.209 (0.130, 0.289)	0.225 (0.209, 0.242)	0.420 (0.373, 0.467)	0.052 (0.026, 0.078)	0.239 (0.199, 0.280)	0.090 (-0.123, 0.316)	0.282 (0.234, 0.330)	
Protocol: Yes	0.014 (-0.352, 0.444)	0.225 (0.168, 0.281)	0.408 (0.365, 0.451)	0.276 (0.202, 0.349)	0.269 (0.174, 0.363)	0.535 (0.107, 0.878)	0.126 (-0.268, 0.553)	
P-value	0.39	0.98	0.72	<0.001	0.57	0.07	0.48	
Management of Cerebral Vasospasm	0.263 (0.226, 0.299)	0.285 (0.278, 0.293)	0.310 (0.297, 0.323)	0.266 (0.255, 0.277)	0.350 (0.334, 0.366)	0.383 (0.306, 0.460)	0.301 (0.276, 0.325)	3.85
Protocol: No	0.252 (0.208, 0.298)	0.290 (0.280, 0.299)	0.332 (0.304, 0.360)	0.270 (0.254, 0.285)	0.353 (0.330, 0.377)	0.435 (0.304, 0.563)	0.300 (0.272, 0.328)	
Protocol: Yes	0.396 (0.157, 0.634)	0.293 (0.261, 0.326)	0.318 (0.293, 0.343)	0.238 (0.197, 0.280)	0.363 (0.309, 0.419)	0.249 (0.028, 0.492)	0.252 (0.030, 0.495)	
P-value	0.24	0.84	0.46	0.17	0.74	0.19	0.72	
<b>Overall</b>	<b>0.299 (0.275, 0.323)</b>	<b>0.278 (0.273, 0.282)</b>	<b>0.356 (0.347, 0.364)</b>	<b>0.201 (0.194, 0.209)</b>	<b>0.304 (0.293, 0.315)</b>	<b>0.347 (0.297, 0.397)</b>	<b>0.288 (0.271, 0.304)</b>	<b>11.25</b>
Protocol: No	0.287 (0.257, 0.317)	0.277 (0.271, 0.284)	0.355 (0.337, 0.374)	0.189 (0.179, 0.199)	0.313 (0.298, 0.329)	0.352 (0.267, 0.436)	0.305 (0.287, 0.324)	
Protocol: Yes	0.387 (0.232, 0.540)	0.274 (0.252, 0.295)	0.368 (0.351, 0.384)	0.257 (0.230, 0.285)	0.291 (0.255, 0.326)	0.350 (0.195, 0.504)	0.219 (0.070, 0.375)	
P-value	0.21	0.74	0.34	<0.001	0.25	0.98	0.28	

# Overall and subgroup agreement by country, stratified according to the presence of anaesthetic protocols for clipping and coiling

Section	Austria	France	Germany	Italy	Spain	Switzerland	UK	H
Presence of a protocol (n/total,%)	3/16 (18.7%)	18/79 (22.8%)	23/44 (52.3%)	14/51 (27.4%)	11/36 (30.6%)	3/8 (37.5%)	3/24 (12.5%)	
General management of SAH	0.300 (0.230, 0.371)	0.243 (0.229, 0.257)	0.191 (0.168, 0.216)	0.134 (0.114, 0.154)	0.152 (0.124, 0.182)	0.267 (0.125, 0.415)	0.257 (0.211, 0.303)	4.14
Protocol: No	0.314 (0.227, 0.402)	0.235 (0.217, 0.253)	0.147 (0.098, 0.197)	0.167 (0.139, 0.196)	0.143 (0.102, 0.186)	0.375 (0.127, 0.623)	0.273 (0.220, 0.326)	
Protocol: Yes	0.597 (0.101, 0.970)	0.247 (0.186, 0.309)	0.225 (0.178, 0.273)	0.072 (0.003, 0.146)	0.150 (0.056, 0.251)	0.153 (-0.220, 0.649)	0.153 (-0.220, 0.649)	
P-value	0.26	0.71	0.03	0.02	0.88	0.44	0.67	
Anaesthetic management for clipping	0.377 (0.325, 0.429)	0.321 (0.311, 0.331)	0.422 (0.404, 0.441)	0.211 (0.195, 0.226)	0.341 (0.318, 0.363)	0.381 (0.273, 0.487)	0.324 (0.288, 0.360)	7.21
Protocol: No	0.351 (0.286, 0.415)	0.316 (0.303, 0.329)	0.397 (0.358, 0.435)	0.180 (0.159, 0.202)	0.334 (0.301, 0.366)	0.370 (0.188, 0.548)	0.367 (0.326, 0.408)	
Protocol: Yes	0.362 (0.024, 0.691)	0.324 (0.279, 0.370)	0.437 (0.402, 0.472)	0.307 (0.248, 0.367)	0.342 (0.265, 0.418)	0.443 (0.100, 0.758)	0.362 (0.024, 0.691)	
P-value	0.50	0.75	0.15	<0.001	0.05	0.12	0.97	
Anaesthetic management for coiling	0.395 (0.338, 0.452)	0.278 (0.267, 0.289)	0.423 (0.403, 0.443)	0.209 (0.192, 0.226)	0.299 (0.274, 0.324)	0.376 (0.257, 0.494)	0.260 (0.222, 0.298)	6.67
Protocol: No	0.351 (0.279, 0.422)	0.283 (0.269, 0.298)	0.409 (0.366, 0.452)	0.172 (0.148, 0.196)	0.374 (0.338, 0.411)	0.348 (0.146, 0.547)	0.297 (0.254, 0.341)	
Protocol: Yes	0.618 (0.237, 0.913)	0.239 (0.188, 0.290)	0.421 (0.382, 0.460)	0.324 (0.258, 0.390)	0.149 (0.068, 0.233)	0.421 (-0.038, 0.775)	0.115 (-0.213, 0.501)	
P-value	0.10	0.10	0.00	<0.001	<0.001	0.15	0.36	
Postoperative Care	0.184 (0.120, 0.248)	0.231 (0.218, 0.243)	0.399 (0.376, 0.421)	0.079 (0.060, 0.098)	0.247 (0.219, 0.275)	0.232 (0.099, 0.365)	0.273 (0.231, 0.315)	8.67
Protocol: No	0.209 (0.130, 0.289)	0.225 (0.209, 0.242)	0.420 (0.373, 0.467)	0.052 (0.026, 0.078)	0.239 (0.199, 0.280)	0.090 (-0.123, 0.316)	0.282 (0.234, 0.330)	
Protocol: Yes	0.014 (-0.352, 0.444)	0.225 (0.168, 0.281)	0.408 (0.365, 0.451)	0.276 (0.202, 0.349)	0.269 (0.174, 0.363)	0.535 (0.107, 0.878)	0.126 (-0.268, 0.553)	
P-value	0.39	0.98	0.72	<0.001	0.57	0.07	0.48	
Management of Cerebral Vasospasm	0.263 (0.226, 0.299)	0.285 (0.278, 0.293)	0.310 (0.297, 0.323)	0.266 (0.255, 0.277)	0.350 (0.334, 0.366)	0.383 (0.306, 0.460)	0.301 (0.276, 0.325)	3.85
Protocol: No	0.252 (0.208, 0.298)	0.290 (0.280, 0.299)	0.332 (0.304, 0.360)	0.270 (0.254, 0.285)	0.353 (0.330, 0.377)	0.435 (0.304, 0.563)	0.300 (0.272, 0.328)	
Protocol: Yes	0.396 (0.157, 0.634)	0.293 (0.261, 0.326)	0.318 (0.293, 0.343)	0.238 (0.197, 0.280)	0.363 (0.309, 0.419)	0.249 (0.028, 0.492)	0.252 (0.030, 0.495)	
P-value	0.24	0.84	0.46	0.17	0.74	0.19	0.72	
<b>Overall</b>	<b>0.299 (0.275, 0.323)</b>	<b>0.278 (0.273, 0.282)</b>	<b>0.356 (0.347, 0.364)</b>	<b>0.201 (0.194, 0.209)</b>	<b>0.304 (0.293, 0.315)</b>	<b>0.347 (0.297, 0.397)</b>	<b>0.288 (0.271, 0.304)</b>	<b>11.25</b>
Protocol: No	0.287 (0.257, 0.317)	0.277 (0.271, 0.284)	0.355 (0.337, 0.374)	0.189 (0.179, 0.199)	0.313 (0.298, 0.329)	0.352 (0.267, 0.436)	0.305 (0.287, 0.324)	
Protocol: Yes	0.387 (0.232, 0.540)	0.274 (0.252, 0.295)	0.368 (0.351, 0.384)	0.257 (0.230, 0.285)	0.291 (0.255, 0.326)	0.350 (0.195, 0.504)	0.219 (0.070, 0.375)	
P-value	0.21	0.74	0.34	<0.001	0.25	0.98	0.28	

# Variability by country in the European Neuroanaesthesia and Critical Care Interest Group subarachnoid haemorrhage survey

Paolo Gritti, Simone Cazzaniga, Carlo Alberto Castioni, Ferdinando Luca Lorini, Lionel J. Velly, Federico Bilotta, on behalf of the European Neuroanaesthesia, Critical Care Interest Group (ENIG)

Eur J Anaesthesiol 2015; 32:1–4

**Table 1** Overall and subgroup agreement by country, stratified according to the presence of anaesthetic protocols for clipping and coiling

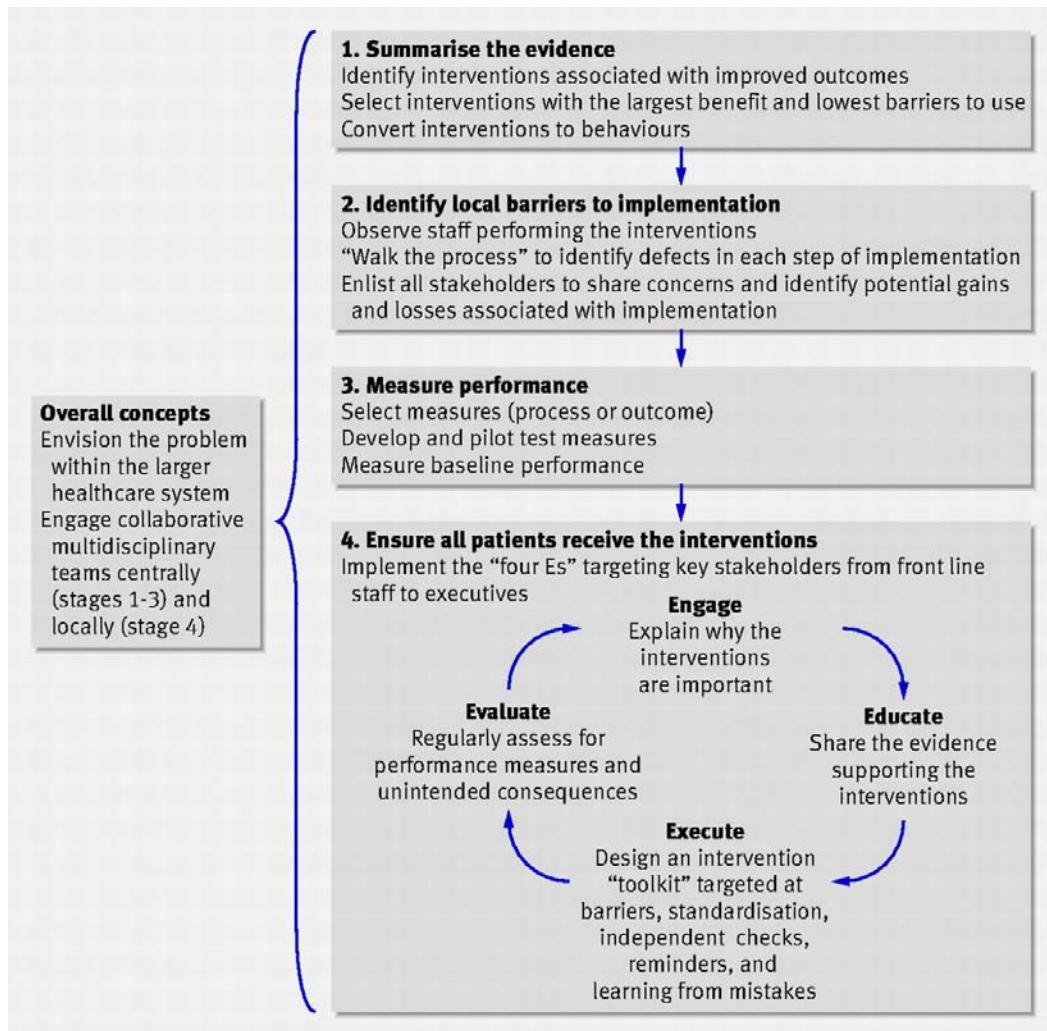
Section	Country							I <sup>2</sup> (%)
	Austria	France	Germany	Italy	Spain	Switzerland	UK	
Presence of a protocol (n/total,%)	3/16 (18.7%)	18/79 (22.8%)	23/44 (52.3%)	14/51 (27.4%)	11/36 (30.6%)	3/8 (37.5%)	3/24 (12.5%)	
General management of SAH	0.30 (0.23, 0.37)	0.24 (0.23, 0.26)	0.19 (0.17, 0.22)	0.13 (0.11, 0.15)	0.15 (0.12, 0.18)	0.27 (0.13, 0.42)	0.26 (0.21, 0.30)	94.2
Protocol: No	0.31 (0.23, 0.40)	0.23 (0.22, 0.25)	0.15 (0.10, 0.20)	0.17 (0.14, 0.20)	0.14 (0.10, 0.19)	0.37 (0.13, 0.62)	0.27 (0.22, 0.33)	
Protocol: Yes	0.60 (0.10, 0.97)	0.25 (0.19, 0.31)	0.23 (0.18, 0.27)	0.07 (0.00, 0.15)	0.15 (0.06, 0.25)	0.15 (−0.22, 0.65)	0.15 (−0.22, 0.65)	
P value	0.26	0.71	0.03	0.02	0.88	0.44	0.67	
Anaesthetic management for clipping	0.38 (0.33, 0.43)	0.32 (0.31, 0.33)	0.42 (0.40, 0.44)	0.21 (0.20, 0.23)	0.34 (0.32, 0.36)	0.38 (0.27, 0.49)	0.32 (0.29, 0.36)	98.1
Protocol: No	0.35 (0.29, 0.41)	0.32 (0.30, 0.33)	0.40 (0.36, 0.44)	0.18 (0.16, 0.20)	0.33 (0.30, 0.37)	0.37 (0.19, 0.55)	0.37 (0.33, 0.41)	
Protocol: Yes	0.36 (0.02, 0.69)	0.32 (0.28, 0.37)	0.44 (0.40, 0.47)	0.31 (0.25, 0.37)	0.34 (0.27, 0.42)	0.44 (0.10, 0.76)	0.36 (0.02, 0.69)	
P value	0.96	0.73	0.13	<0.001	0.85	0.72	0.97	
Anaesthetic management for coiling	0.39 (0.34, 0.45)	0.28 (0.27, 0.29)	0.42 (0.40, 0.44)	0.21 (0.19, 0.23)	0.30 (0.27, 0.32)	0.38 (0.26, 0.49)	0.26 (0.22, 0.30)	97.8
Protocol: No	0.35 (0.28, 0.42)	0.28 (0.27, 0.30)	0.41 (0.37, 0.45)	0.17 (0.15, 0.20)	0.37 (0.34, 0.41)	0.35 (0.15, 0.55)	0.30 (0.25, 0.34)	
Protocol: Yes	0.62 (0.24, 0.91)	0.24 (0.19, 0.29)	0.42 (0.38, 0.46)	0.32 (0.26, 0.39)	0.15 (0.07, 0.23)	0.42 (0.04, 0.77)	0.11 (−0.21, 0.50)	
P value	0.18	0.10	0.68	<0.001	<0.001	0.75	0.36	
Postoperative care	0.18 (0.12, 0.25)	0.23 (0.22, 0.24)	0.40 (0.38, 0.42)	0.08 (0.06, 0.10)	0.25 (0.22, 0.27)	0.23 (0.10, 0.36)	0.27 (0.23, 0.32)	98.7
Protocol: No	0.21 (0.13, 0.29)	0.23 (0.21, 0.24)	0.42 (0.37, 0.47)	0.05 (0.03, 0.08)	0.24 (0.20, 0.28)	0.09 (−0.12, 0.32)	0.28 (0.23, 0.33)	
Protocol: Yes	0.01 (−0.35, 0.44)	0.22 (0.17, 0.28)	0.41 (0.37, 0.45)	0.28 (0.20, 0.35)	0.27 (0.17, 0.36)	0.53 (0.11, 0.88)	0.13 (−0.27, 0.55)	
P value	0.39	0.98	0.72	<0.001	0.57	0.07	0.48	
Management of cerebral vasospasm	0.26 (0.23, 0.30)	0.29 (0.28, 0.29)	0.31 (0.30, 0.32)	0.27 (0.25, 0.28)	0.35 (0.33, 0.37)	0.38 (0.31, 0.46)	0.30 (0.28, 0.32)	93.3
Protocol: No	0.25 (0.21, 0.30)	0.29 (0.28, 0.30)	0.33 (0.30, 0.36)	0.27 (0.25, 0.29)	0.35 (0.33, 0.38)	0.43 (0.30, 0.56)	0.30 (0.27, 0.33)	
Protocol: Yes	0.40 (0.16, 0.63)	0.29 (0.26, 0.33)	0.32 (0.29, 0.34)	0.24 (0.20, 0.28)	0.36 (0.31, 0.42)	0.25 (0.03, 0.49)	0.25 (0.03, 0.50)	
P value	0.24	0.84	0.46	0.17	0.74	0.19	0.72	
Overall	0.30 (0.27, 0.32)	0.28 (0.27, 0.28)	0.36 (0.35, 0.36)	0.20 (0.19, 0.21)	0.30 (0.29, 0.31)	0.35 (0.30, 0.40)	0.29 (0.27, 0.30)	99.2
Protocol: No	0.29 (0.26, 0.32)	0.28 (0.27, 0.28)	0.36 (0.34, 0.37)	0.19 (0.18, 0.20)	0.31 (0.30, 0.33)	0.35 (0.27, 0.44)	0.31 (0.29, 0.32)	
Protocol: Yes	0.39 (0.23, 0.54)	0.27 (0.25, 0.30)	0.37 (0.35, 0.38)	0.26 (0.23, 0.29)	0.29 (0.25, 0.33)	0.35 (0.19, 0.50)	0.22 (0.07, 0.37)	
P value	0.21	0.74	0.34	<0.001	0.25	0.98	0.28	

Results are presented as the unconditional Brennan-Prediger kappa ( $k$ ) statistic (95% confidence interval). Values of  $k$  may be interpreted as follows: <0, poor; 0.01 to 0.20, slight; 0.21 to 0.40, fair; 0.41 to 0.60, moderate; 0.61 to 0.80, substantial; and >0.80, almost perfect agreement.<sup>8</sup> Countries with less than five responders were excluded.  $I^2$ , heterogeneity index of Higgins and Thompson: values greater than 50% indicate considerable heterogeneity. Heterogeneity across countries was tested using the Cochran Q statistic. All tests were significant at  $P < 0.001$ . SAH, subarachnoid haemorrhage.



# Strategy for translating evidence into practice.

To improve patient health, research knowledge must be translated into routine practice. Such knowledge translation is an emerging science in which researchers must partner with practising clinicians



Peter J Pronovost et al. BMJ 2008;337:bmj.a1714



# Conclusioni = Non sono Raccomandazioni

- C'è ancora eterogeneità nel trattamento del paziente affetto da ESA e questo può inficiare l'outcome
- Avviare pazienti in centri con alta esperienza sul trattamento del ESA e delle sue complicanze
- Disporre di un protocollo sul management del paziente affetto da aneurisma subaracnoideo consente di aumentare l'agreement nel trattamento dell'ESA
- Una survey può essere letta da prospettive diverse

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