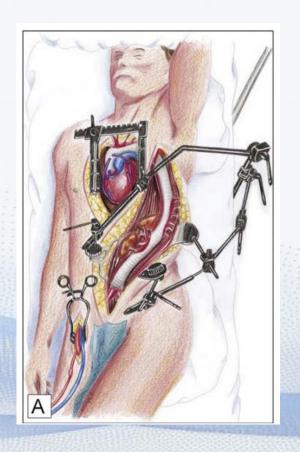


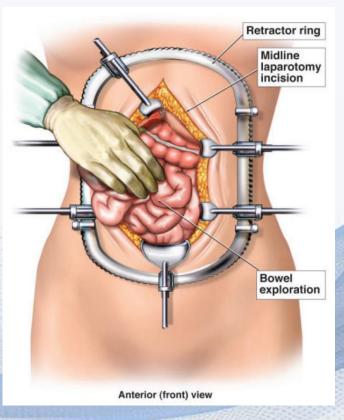
The anaesthetist's perspective: what monitoring is needed for what clinical problem?

Dr Grégoire Cane

Neuro – anesthésie – réanimation hôpital Pellegrin, Bordeaux, France

Anesthesia ...







• What is anesthesia?

Immobility

Surgical act

Loss of tone

Neuromuscular junction

Curares

Analgesia

No psychological trauma

Reduce hemodynamic effects

Autonomous nervous system

Morphinics

Lost of consciousness / Amnesia

No psychological trauma

Better experience of surgery

Central nervous system

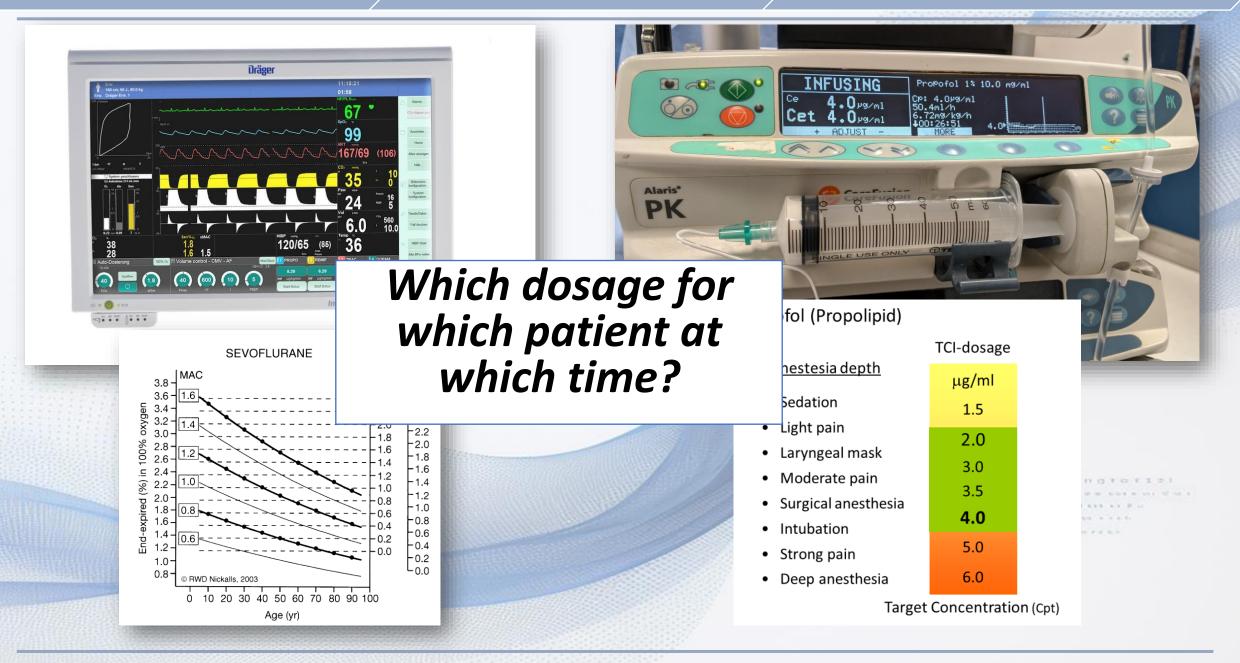
Hypnotics



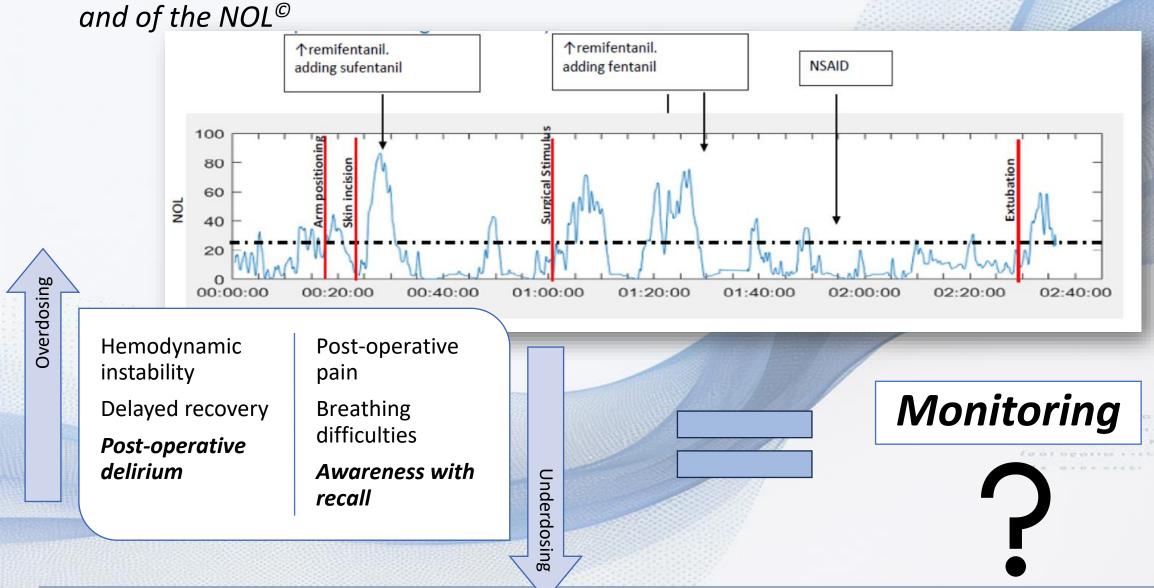








• The challenge: the right product at the right time. Example of shoulder surgery



What are we trying to assess?

- Immobility / Muscle paralysis
 - TOF



- Nociception / Pain
 - ANI
 - NOL



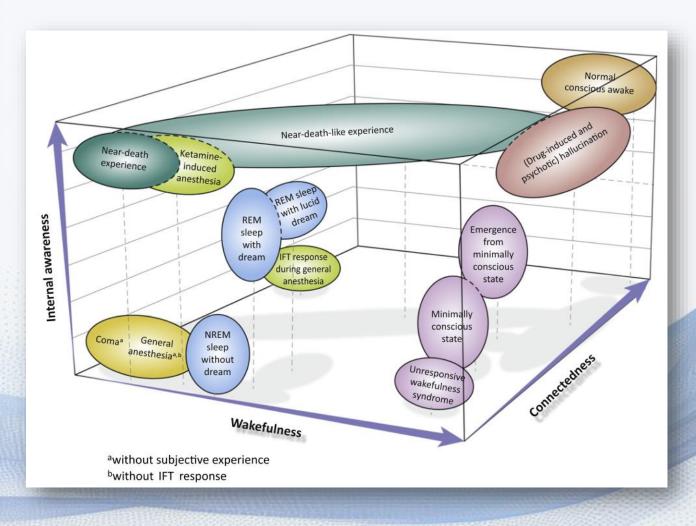
- Hypnosis / Consciousness
 - BIS
 - Entropy





- Ideal monitor = clinical impact
 - Therapeutic anticipation
 - Under- and overdosing measurement
 - Adapted to the operating room environment (interference, robust, easy to install)

How to define consciousness?



- Clinically:
 - Eyes opening ≈ Wakefulness
 - Response to simple commands ≈ Connectedness
 - Patient memory ≈ Internal awareness

Anesthesia ?? Coma in brain injured patients ???

- How can we assess these different states during anesthesia?
- Wakefulness:

Practical anesthesia management

- Ciliary reflex
- Spontaneous breathing
- Connectedness:
 - Responses to simple commands
- Internal Awareness:
 - Memorization of the patient

- 1. What is the last thing you remember before going to sleep?
- 2. What is the first thing you remember waking up?
- 3. Do you remember anything between going to sleep and waking up?
- 4. Did you dream during your procedure?
- 5. What was the worst thing about your operation?

Isolated Forearm Test

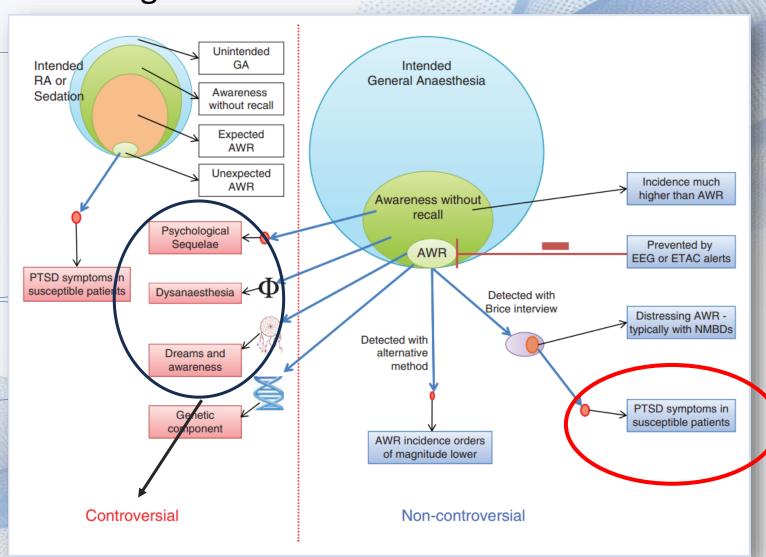


Brice Interview

Altered states of consciousness during anesthesia

Dreams

- Internal awareness
- No response to IFT
- Awareness without recall
 - Response to IFT
 - Negative Brice interview
 - Awareness with recall
 - Positive Brice intervi



How common is this ??

BJA

British Journal of Anaesthesia, 121 (1): 198-209 (2018)

doi: 10.1016/j.bja.2018.02.019
Advance Access Publication Date: 27 March 2018
Review Article

REVIEW ARTICLES

Isolated forearm technique: a meta-analysis of connected consciousness during different general anaesthesia regimens

F. Linassi^{1,*}, P. Zanatta², P. Tellaroli³, C. Ori¹ and M. Carron¹

- 1131 General Anesthesia
 - 35 % Awareness without recall

- Awareness without recall ≈ 10 %
- Awareness with recall ≈ 0.1 %



BJA



British Journal of Anaesthesia, 130 (2): e217-e224 (2023)

doi: 10.1016/j.bja.2022.04.010 Advance Access Publication Date: 23 May 2022 Consciousness

CONSCIOUSNESS

Connected consciousness after tracheal intubation in young adults: an international multicentre cohort study

Richard Lennertz¹, Kane O. Pryor², Aeyal Raz³, Maggie Parker¹, Vincent Bonhomme⁴, Peter Schuller⁵, Gerhard Schneider⁶, Matt Moore⁷, Mark Coburn⁸, James C. Root^{2,9}, Jacqueline M. Emerson², Alexandra L. Hohmann², Haya Azaria³, Neta Golomb³, Aline Defresne⁴, Javier Montupil⁴, Stefanie Pilge⁶, David P. Obert⁶, Hanna van Waart⁷, Marta Seretny⁷, Rolf Rossaint¹⁰, Ana Kowark¹⁰, Alexander Blair¹, Bryan Krause¹, Alex Proekt¹¹, Max Kelz¹¹, Jamie Sleigh¹², Amy Gaskell¹² and Robert D. Sanders^{13,14,*}

- 338 General Anesthesia
 - 14 % Dreams
 - 11 % Awareness without recall
 - 0,3 % Awareness with recall (1,5 % possible)
 - No implicit memory

• Posttraumatic stress disorders (PTSD)

ARTICLES

Bispectral index monitoring to prevent awareness during anaesthesia: the B-Aware randomised controlled trial

13 awareness with recall confirmed

5 years of follow – up

6 dead

5 on 7 with PTSD (71% vs 12% in control group)

toliotianglotist

andmatmiss core of Core

and operation of Par

foologotto core

• <u>Bispectral index = processed EEG</u>

- Adimensional number between 0 and 100
- 60 80 : ligth sedation
- 40 60 : suitable for surgery



Zhang 2011



Cochrane Database of Systematic Reviews

Bispectral index for improving intraoperative awareness and early postoperative recovery in adults (Review)

Lewis SR, Pritchard MW, Fawcett LJ, Punjasawadwong Y

- Odds ratio lower ...
- ... But thanks to a low quality study

Random sequence generation (selection bias)

Allocation concealment (selection bias)

Blinding of participants and personnel (performance bias): All outcomes

Blinding of outcome assessment (detection bias): All outcomes

Incomplete outcome data (attrition bias): All outcomes

Selective reporting (reporting bias)

Other bias

Analysis 1.1. Comparison 1: BIS versus clinical sides, Outcome 1: Occurrence of intraoperative awareness

Study or Subgroup	BIS		Clinical signs			Peto Odds Ratio	Peto Odds Ratio
	Events	Total	Events	Total	Weight P	Peto, Fixed, 95% CI	Peto, Fixed, 95% CI
Anez 2001	0	20	0	19		Not estimable	
Assare 2002	0	20	0	20		Not estimable	
Bruhn 2005	0	71	0	71		Not estimable	
Ellerkmann 2010	0	27	0	27		Not estimable	
Guo 2015	0	20	0	20		Not estimable	
Ibraheim 2008	0	15	0	15		Not estimable	
Kabukcu 2012	0	35	0	35		Not estimable	
Kamal 2009	0	29	0	28		Not estimable	
Kamali 2017a	0	107	8	107	13.9%	0.13 [0.03, 0.52]	
Karaca 2014	0	41	0	41		Not estimable	
Kim 2003	0	19	0	20		Not estimable	
Kreuer 2003	0	40	0	40		Not estimable	
Kreuer 2005	0	40	0	40		Not estimable	
Luginbuhl 2003	0	80	0	80		Not estimable	
Mozafari 2014	9	163	7	170	27.5%	1.36 [0.50, 3.70]	
Myles 2004	2	1225	11	1238	23.3%	0.25 [0.08, 0.75]	
Persec 2012	0	20	0	20		Not estimable	_
Puri 2003	0	14	1	16	1.8%	0.15 [0.00, 7.80]	
Rahul 2015	0	80	0	80		Not estimable	,
Recart 2003	0	30	0	30		Not estimable	
Song 1997	0	30	0	30		Not estimable	
Sudhakaran 2018	0	21	0	21		Not estimable	
White 2004	0	20	0	20		Not estimable	
Wong 2002	0	29	0	31		Not estimable	
Zhang 2011	4	2919	15	2309	33.6%	0.24 [0.10, 0.60]	
Zhang 2016	0	36	0	26		Not estimable	_
Zohar 2006	0	25	0	25		Not estimable	
Total (95% CI)		5176		4589	100.0%	0.36 [0.21 , 0.60]	•
Total events:	15		42				▼
Heterogeneity: Chi ² = 1	0.17, df = 4 (P = 0.04);	I ² = 61%				0.005 0.1 1 10 200
Test for overall effect: 2			Favours BIS Favours CS				
Test for subgroup differ		,					

Analysis 3.1. Comparison 3: BIS versus ETAG, Outcome 1: Occurrence of intraoperative awareness

	BIS		ETAG			Peto Odds Ratio	Peto Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% CI	Peto, Fixed, 95% CI
Avidan 2008	2	967	2	974	12.5%	1.01 [0.14 , 7.16]	
Avidan 2011	7	2861	2	2852	28.1%	3.03 [0.82, 11.21]	 •
Mashour 2012	8	9460	11	9376	59.4%	0.72 [0.29, 1.78]	_ _
Muralidhar 2008	0	20	0	20		Not estimable	, 7
Sudhakaran 2018	0	21	0	21		Not estimable	
Total (95% CI)	13329		13243	100.0%	1.13 [0.56 , 2.26]	•	
Total events:	17		15				T
Heterogeneity: Chi ² = 3.15, df = 2 (P = 0.21); I ² = 37%							0.01 0.1 1 10 100
Test for overall effect:	Z = 0.34 (P =	0.73)					Favours BIS Favours ETAG
Test for subgroup diffe	rences: Not a	pplicable					

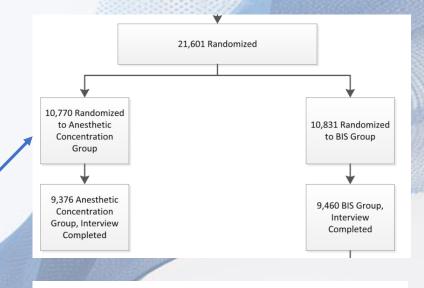
Published in final edited form as:

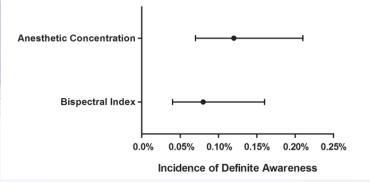
Anesthesiology. 2012 October; 117(4): 717-725. doi:10.1097/ALN.0b013e31826904a6.

Prevention of Intraoperative Awareness with Explicit Recall in an Unselected Surgical Population: A Randomized Comparative Effectiveness Trial

George A. Mashour, M.D., Ph.D. †,* , Amy Shanks, M.S. ‡,* , Kevin K. Tremper, Ph.D., M.D. § , Sachin Kheterpal, M.D., M.B.A. $^{\sharp}$, Christopher R. Turner, M.D., Ph.D., M.B.A. $^{\sharp}$, Satya Krishna Ramachandran, M.D., F.R.C.A. $^{\parallel}$, Paul Picton, M.D., F.R.C.A. $^{\parallel}$, Christa Schueller, B.S. $^{\Delta}$, Michelle Morris, M.S. $^{\bullet}$, John C. Vandervest, B.S. †† , Nan Lin, Ph.D. ‡‡ , and Michael S. Avidan, M.B.B.Ch. §§

 No differences with well conducted anesthesia and MAC monitoring!





20 000 patients, no differences

ARTICLE

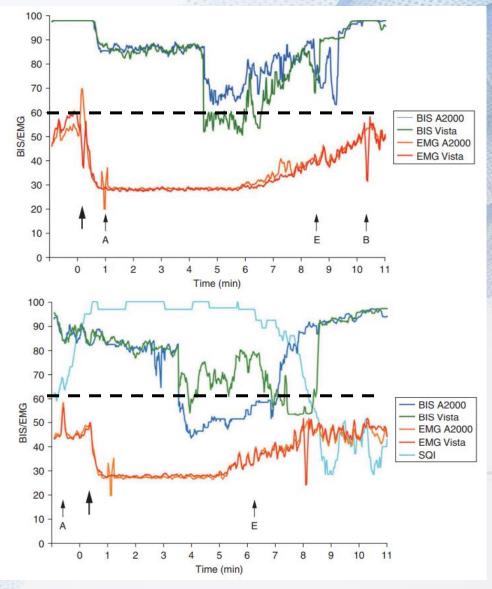
Response of bispectral index to neuromuscular block in awake volunteers[†]

P. J. Schuller*, S. Newell, P. A. Strickland, and J. J. Barry

Department of Anaesthesia & Intensive Care, Cairns Hospital, PO Box 902, Cairns QLD 4870, Australia

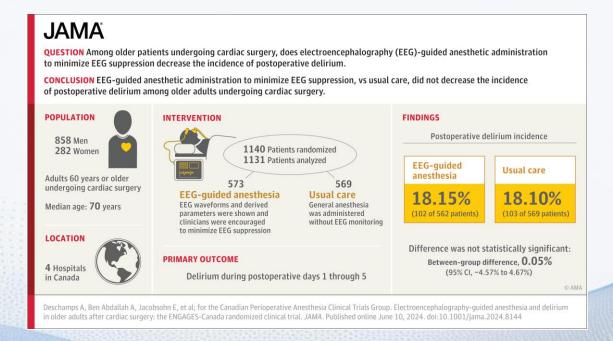


- Raw EEG with rapid frequences = awake patient
- However, low BIS values with disparition of EMG

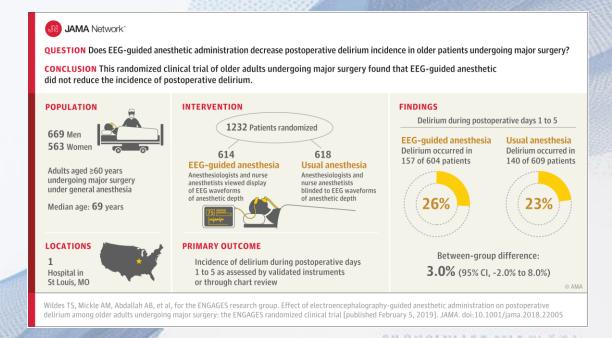


What about surdosage and delirium ?

Cardiac surgery ...



Older patients ...



O F O VILIAN O FAIR AND P. or

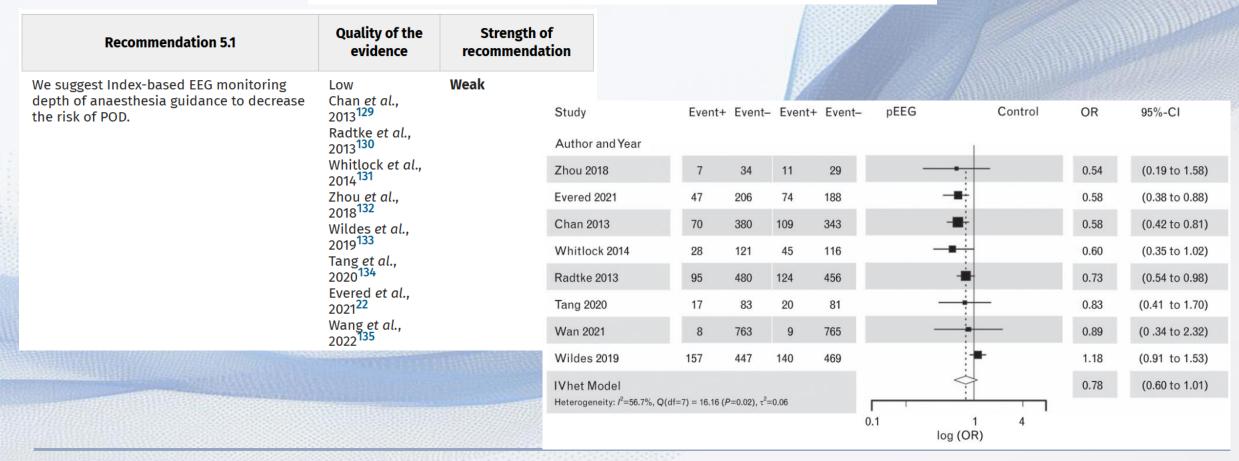
Edw management

... NS

.. NS

GUIDELINES

Update of the European Society of Anaesthesiology and Intensive Care Medicine evidence-based and consensus-based guideline on postoperative delirium in adult patients



- Anaesthesia = continuous adaptation between noxious stimuli and drug infusion
- Awareness with recall is a rare but severe complication
- Awareness without recall is frequent but of dubious clinical interest
- Most commonly used monitor, BIS, has not been proven effective through evidence based medicine protocols for overdosing and underdosing



- Ideal monitor of consciousness (nociception ?)
 - Therapeutic anticipation
 - Under- and overdosing measurement
 - Adapted to the operating room environment (interference, robust, easy to install)