Technologie v monitoringu hloubky anestezie

XXIX.
kongres České společnosti
anesteziologie, resuscitace
a intenzivní medicíny

5.-7. října 2023
CLARION CONGRESS HOTEL PRAGUE
www.csarim.cz

JAN BLÁHA

KLINIKA ANESTEZIOLOGIE, RESUSCITACE A INTENZIVNÍ MEDICÍNY

1. LÉKAŘSKÁ FAKULTA
Univerzita Karlova

VŠEOBECNÁ FAKULTNÍ NEMOCNICE V PRAZE

jan.blaha@vfn.cz

Možný konflikt zájmů: ?

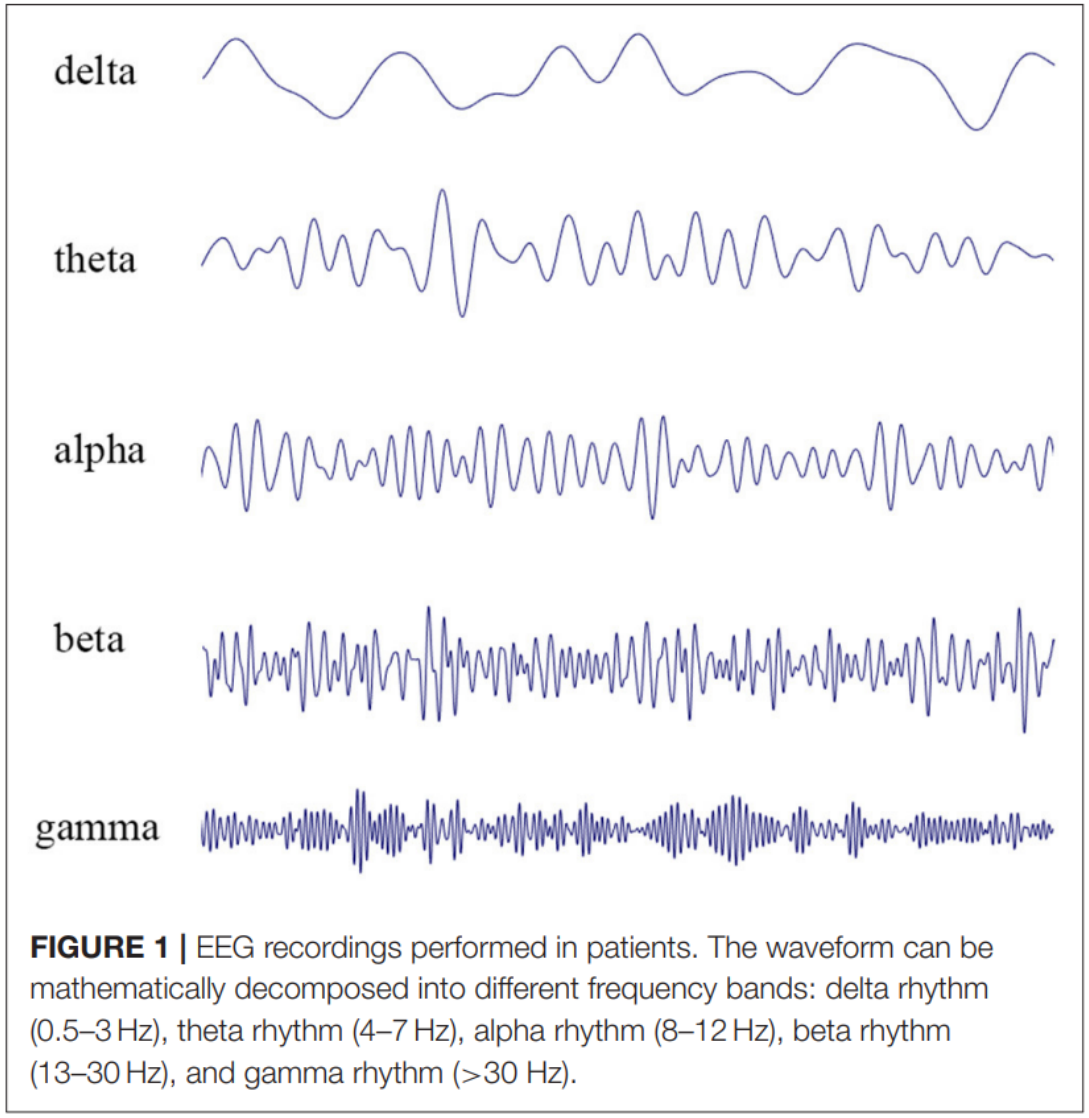


FIGURE 1 | EEG recordings performed in patients. The waveform can be mathematically decomposed into different frequency bands: delta rhythm (0.5–3 Hz), theta rhythm (4–7 Hz), alpha rhythm (8–12 Hz), beta rhythm (13–30 Hz), and gamma rhythm (>30 Hz).

Sun et al. Front. Med. 7:251.

Arch Neurosci. 2020 July; 7(3):e96490. doi: 10.5812/ans.96490.

A Review of Bispectral Index Utility in Neurocritical Care Patients

Hossein Yousefi-Banaem [1], Reza Goharani [2], Mohammadreza Hajiesmaeili [2], Arash Tafrishinejad [2], Masoud Zangi [2], Mahdi Amirdosara [2] and Masoud Nashibi [2,*]

[1]Skull Base Research Center, Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[2]Anesthesiology Research Center, Anesthesia and Critical Care Department, Shahid Beheshti University of Medical Sciences, Tehran, Iran

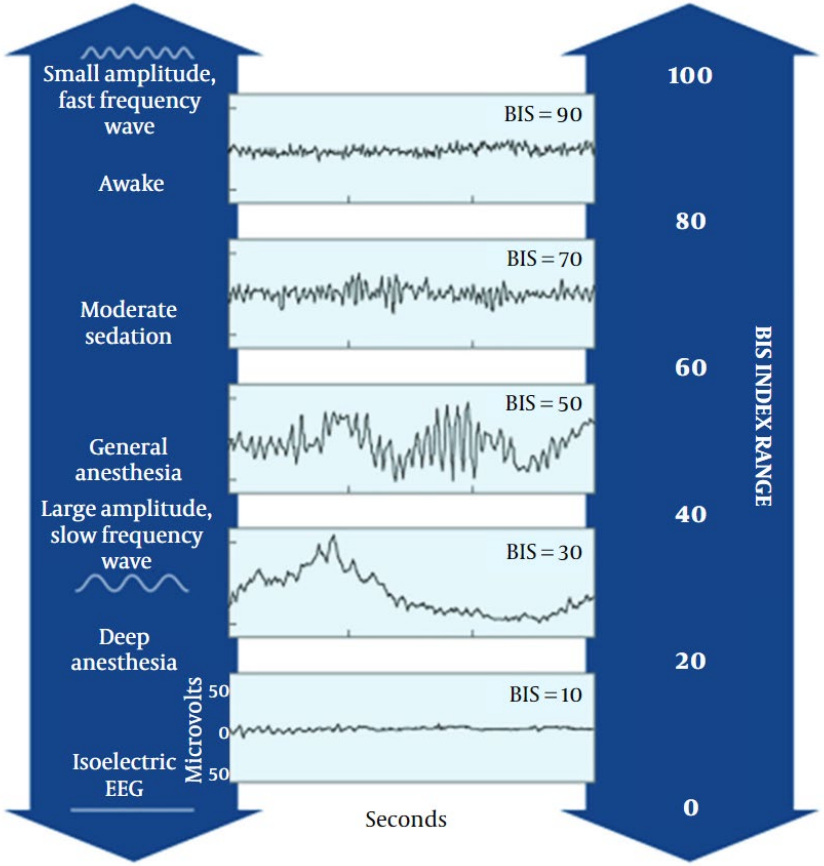


Figure 1. BIS index numerical values, zero (EEG suppression) to 100 (fully consciousness)

ELSEVIER

Matrix codes:
2A04, 3J0

Accidental
Incidence,
manageme

M.C. Kim[1,*], G.

[1]Massachusetts Gene
for Mind Body Medic
USA

Risk factors: are there any circumstances in which awareness is more or less likely?

NAP5 identified a number of situations in which the risk of accidental awareness is increased. These include:

Patient factors

- Aged 25–45.
- Obesity.
- Women.

Types of surgery

- Obstetrics (especially caesarean section).
- Cardiac (heart) surgery.
- Thoracic (chest) surgery.

Clinical settings

- The use of muscle relaxant drugs.
- Anaesthetics given in an emergency.
- Operations performed out of hours.

5 | www.rcoa.ac.uk/patientinfo

ELSEVIER

Revalidation FOR ANAESTHETISTS RCA Revalidation matrix
Matrix codes: 1E06, 2A04, 3J02

BJA Education, 21(4): 154–161 (2021)

doi: 10.1016/j.bjae.2020.12.001
Advance Access Publication Date: 21 January 2021

Accidental awareness under general anaesthesia: Incidence, risk factors, and psychological management

M.C. Kim[1,*], G.L. Fricchione[1,2] and O. Akeju[1]

[1]Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA and [2]Benson-Henry Institute for Mind Body Medicine and the McCance Center for Brain Health, Harvard Medical School, Boston, MA, USA

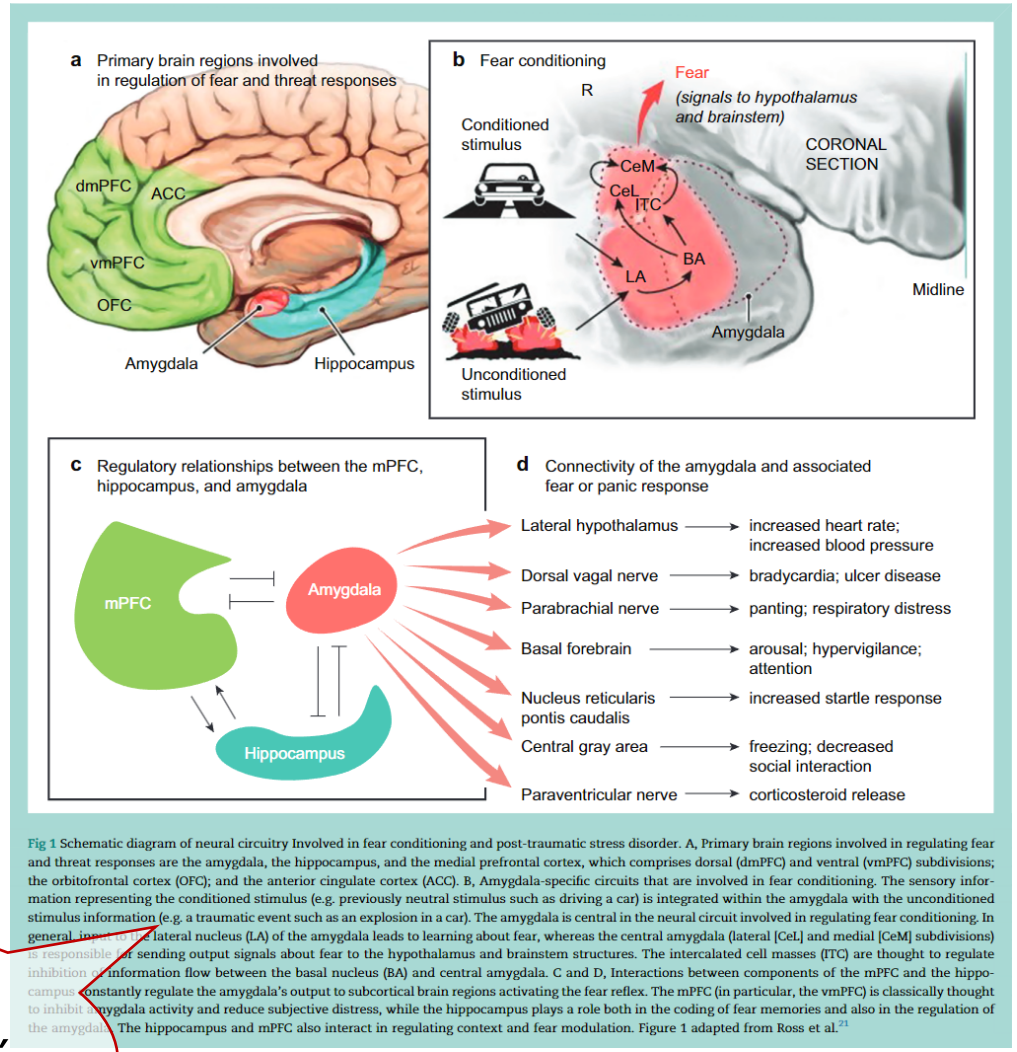


Fig 1 Schematic diagram of neural circuitry Involved in fear conditioning and post-traumatic stress disorder. A, Primary brain regions involved in regulating fear and threat responses are the amygdala, the hippocampus, and the medial prefrontal cortex, which comprises dorsal (dmPFC) and ventral (vmPFC) subdivisions; the orbitofrontal cortex (OFC); and the anterior cingulate cortex (ACC). B, Amygdala-specific circuits that are involved in fear conditioning. The sensory information representing the conditioned stimulus (e.g. previously neutral stimulus such as driving a car) is integrated within the amygdala with the unconditioned stimulus information (e.g. a traumatic event such as an explosion in a car). The amygdala is central in the neural circuit involved in regulating fear conditioning. In general, input to the lateral nucleus (LA) of the amygdala leads to learning about fear, whereas the central amygdala (lateral [CeL] and medial [CeM] subdivisions) is responsible for sending output signals about fear to the hypothalamus and brainstem structures. The intercalated cell masses (ITC) are thought to regulate inhibition of information flow between the basal nucleus (BA) and central amygdala. C and D, Interactions between components of the mPFC and the hippocampus constantly regulate the amygdala's output to subcortical brain regions activating the fear reflex. The mPFC (in particular, the vmPFC) is classically thought to inhibit amygdala activity and reduce subjective distress, while the hippocampus plays a role both in the coding of fear memories and also in the regulation of the amygdala. The hippocampus and mPFC also interact in regulating context and fear modulation. Figure 1 adapted from Ross et al.[21]

~1:19,000 in all anaesthetics

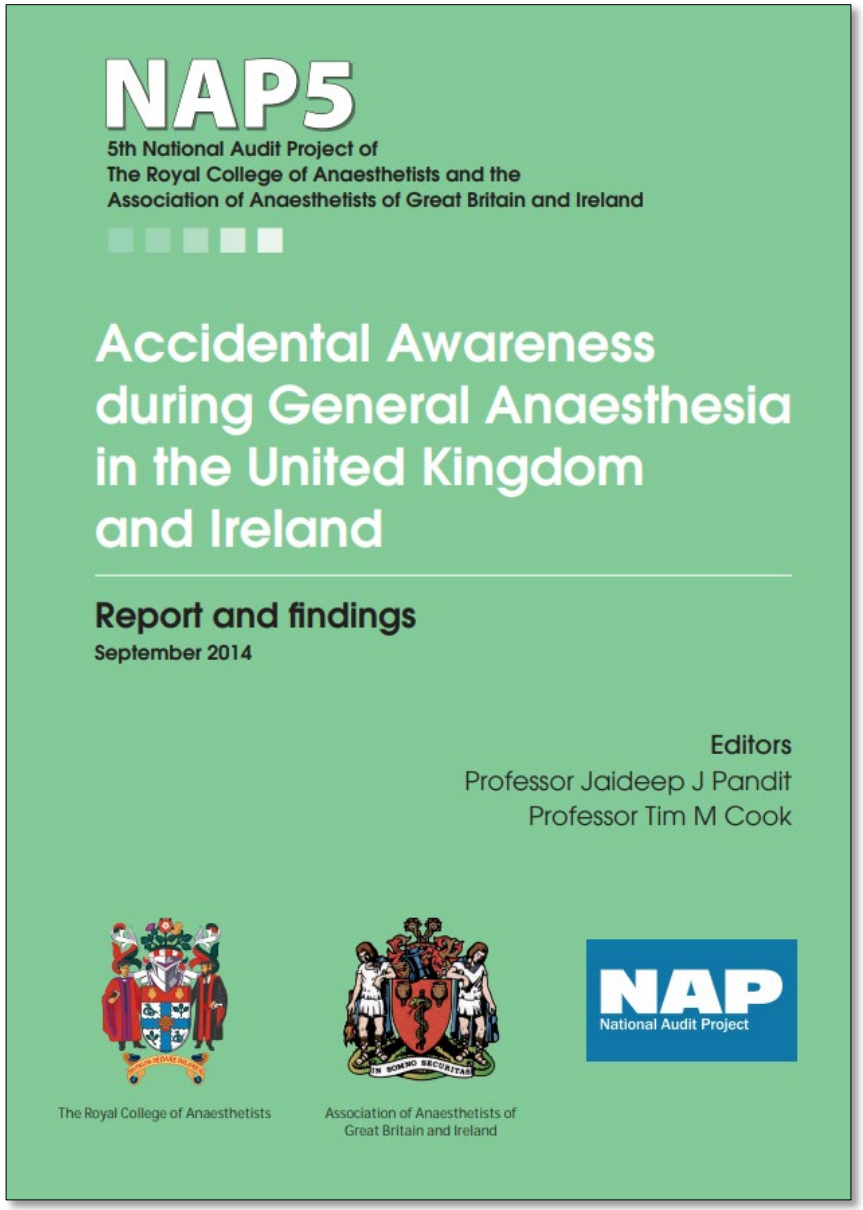
~1:8600 when NMB was used

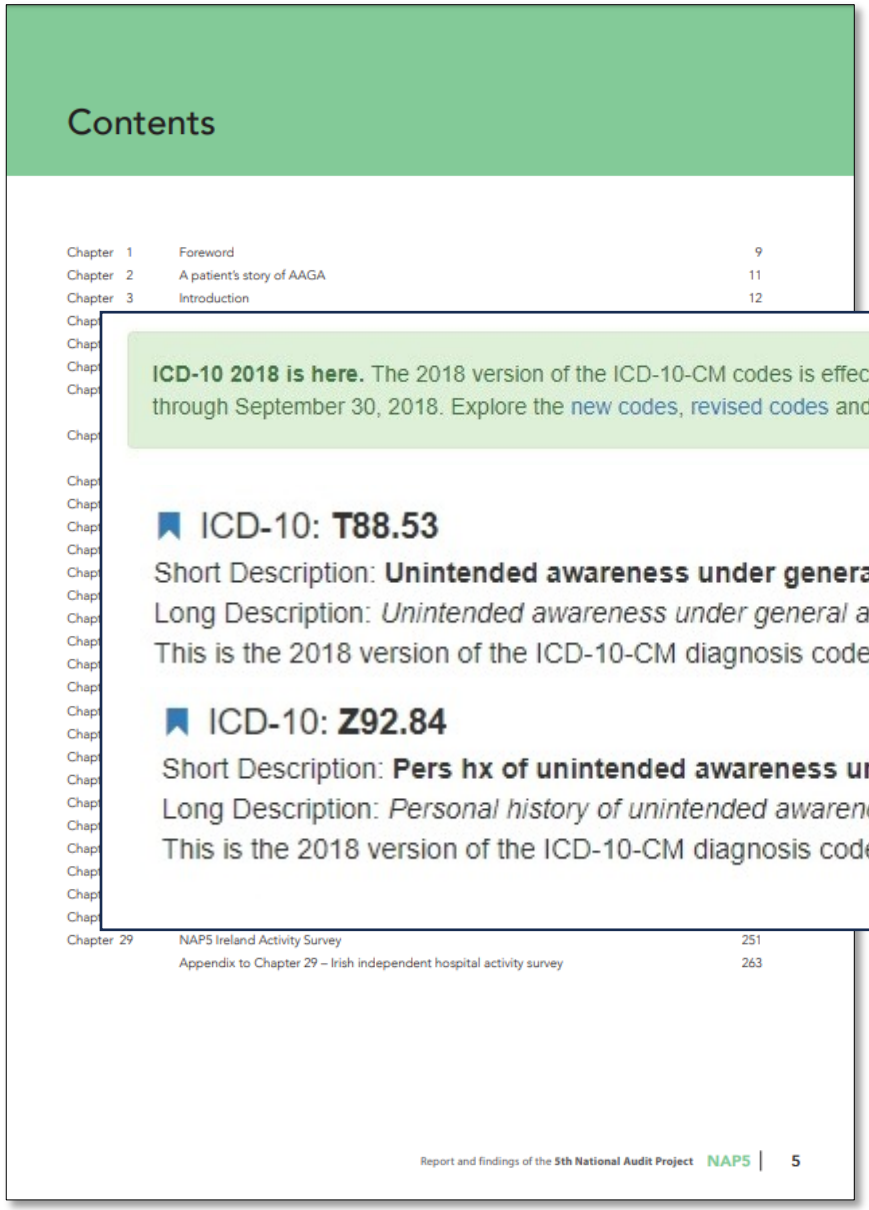
~1:8600 in cardiothoracic anaesthesia

~1:670 Caesarean section

NAP5 (2014)

riziko posttraumatické stresové poruchy !


NAP5
5th National Audit Project of
The Royal College of Anaesthetists and the
Association of Anaesthetists of Great Britain and Ireland
Accidental Awareness during General Anaesthesia in the United Kingdom and Ireland
Report and findings
September 2014
Editors
Professor Jaideep J Pandit
Professor Tim M Cook
The Royal College of Anaesthetists
Association of Anaesthetists of Great Britain and Ireland
NAP
National Audit Project


Contents
Chapter 1 Foreword 9
Chapter 2 A patient's story of AAGA 11
Chapter 3 Introduction 12
Chapter 29 NAP5 Ireland Activity Survey 251
Appendix to Chapter 29 – Irish independent hospital activity survey 263
ICD-10 2018 is here. The 2018 version of the ICD-10-CM codes is effective from October 1, 2017 through September 30, 2018. Explore the new codes, revised codes and deleted codes.
ICD-10: T88.53
Short Description: Unintended awareness under general anesth during procedure
Long Description: Unintended awareness under general anesthesia during procedure
This is the 2018 version of the ICD-10-CM diagnosis code T88.53
ICD-10: Z92.84
Short Description: Pers hx of unintended awareness under general anesthesia
Long Description: Personal history of unintended awareness under general anesthesia
This is the 2018 version of the ICD-10-CM diagnosis code Z92.84
Report and findings of the 5th National Audit Project NAP5 | 5

Anesthesiology 2009; 110:759–65

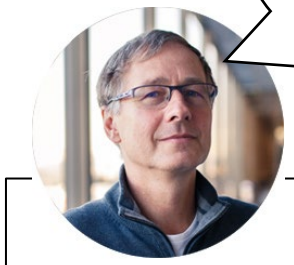
Epidemiology of Anesthesia-related Mortality in the United States, 1999–2005

Guohua Li, M.D., Dr.P.H., Margaret Warner, Ph.D.,† Barbara H. Lang, B.S.,‡ Lin Huang, M.S.,§ Lena S. Sun, M.D.‖*

Table 2. Anesthesia-related Deaths by Type of Complication, United States, 1999–2005

Type of Complication	Number of Deaths	%
Complications of anesthesia during pregnancy, labor, and puerperium	79	3.6
Cardiac complications	60	2.7
Overdose of anesthetics	1,030	46.6
Inhaled anesthetics	233	10.5
Intravenous anesthetics	419	19.0
Other and unspecified general anesthetics	254	11.5
Local anesthetics	86	3.9
Unspecified anesthetics	38	1.7
Adverse effects of anesthetics in therapeutic use	940	42.5
Opioids and related analgesics	439	19.9
Benzodiazepines	42	1.9
Other and unspecified general anesthetics	40	1.8
Local anesthetics	137	6.2
Unspecified anesthetics	257	11.6
Other complications of anesthesia	162	7.3
Malignant hyperthermia	22	1.0
Failed or difficult intubation	50	2.3
Total	2,211	100.0

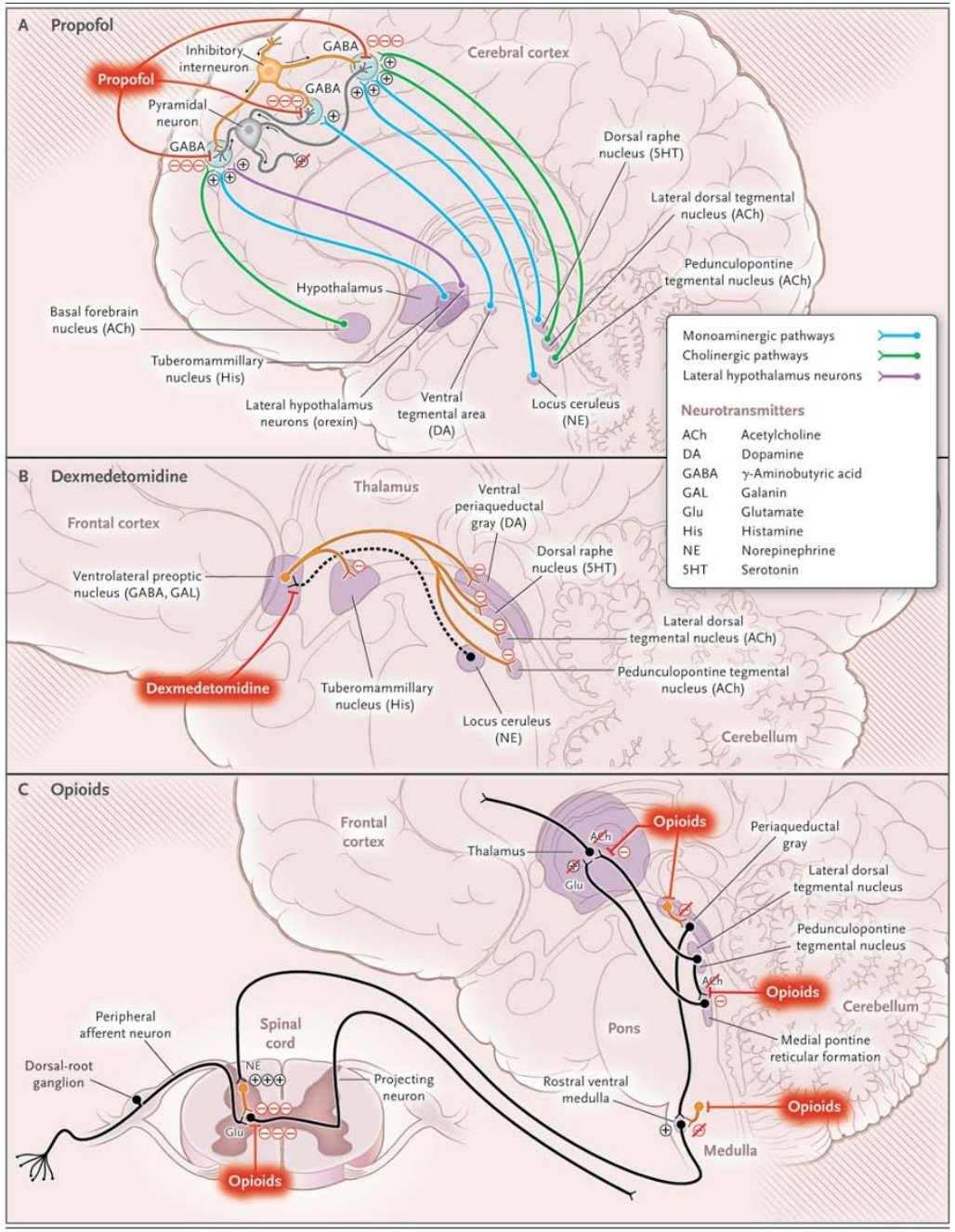
ICD-10 = *International Classification of Diseases*, 10th Revision.



„Navzdory běžnému klinickému užívání nedokážeme vysvětlit, jak anestetika vyvolávají amnezii, bezvědomí a imobilizaci – tedy základní rysy celkové anestezie.“

Hemmings jr. Brit J Anaesth 2009;103(1):61-9

Co je to anestezie, to ví jen pár tibetských mnichů!



Brown EN. N Engl J Med 2010;363:2638-50

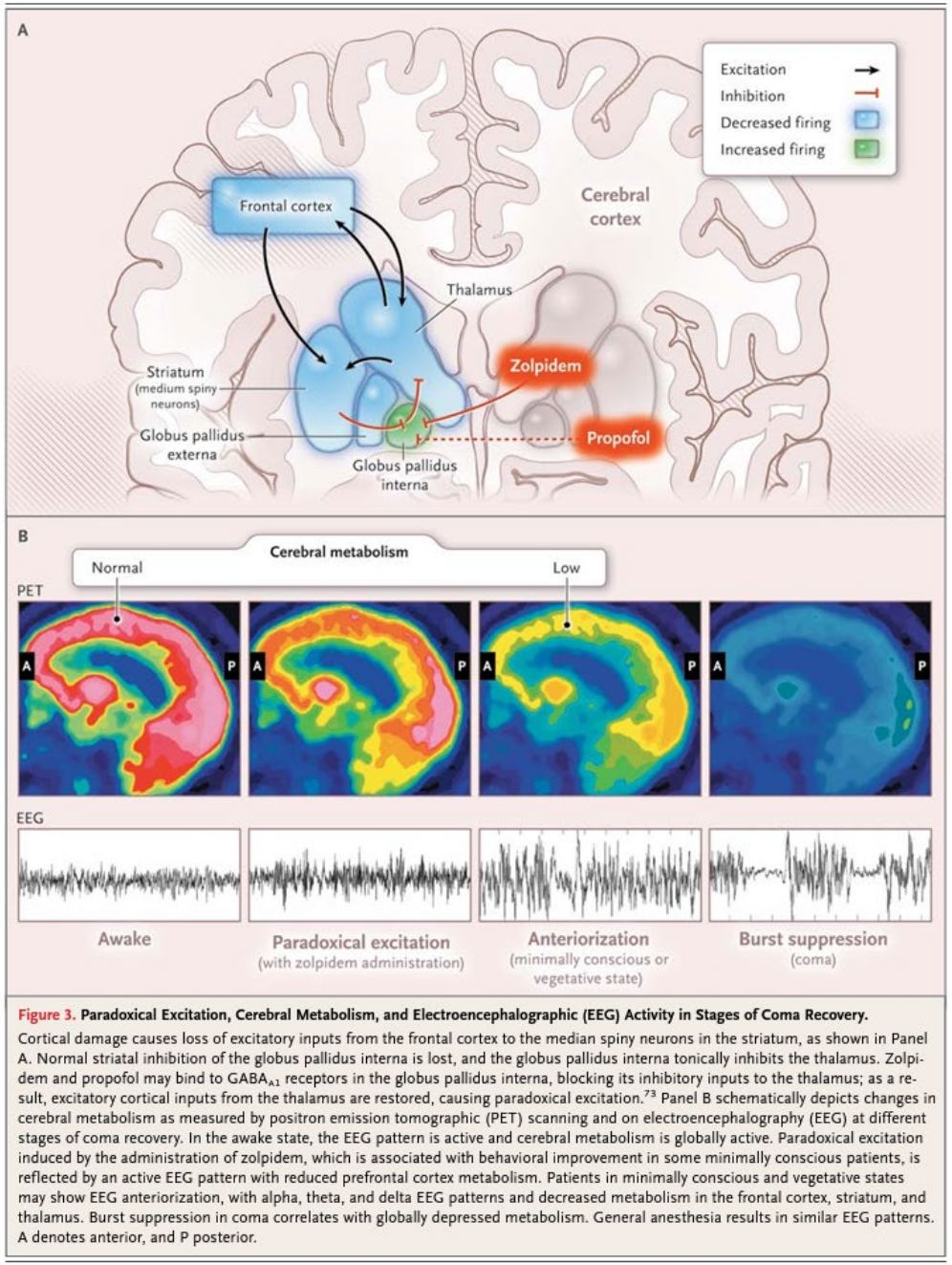


Figure 3. Paradoxical Excitation, Cerebral Metabolism, and Electroencephalographic (EEG) Activity in Stages of Coma Recovery.

Cortical damage causes loss of excitatory inputs from the frontal cortex to the median spiny neurons in the striatum, as shown in Panel A. Normal striatal inhibition of the globus pallidus interna is lost, and the globus pallidus interna tonically inhibits the thalamus. Zolpidem and propofol may bind to $GABA_{A1}$ receptors in the globus pallidus interna, blocking its inhibitory inputs to the thalamus; as a result, excitatory cortical inputs from the thalamus are restored, causing paradoxical excitation.[73] Panel B schematically depicts changes in cerebral metabolism as measured by positron emission tomographic (PET) scanning and on electroencephalography (EEG) at different stages of coma recovery. In the awake state, the EEG pattern is active and cerebral metabolism is globally active. Paradoxical excitation induced by the administration of zolpidem, which is associated with behavioral improvement in some minimally conscious patients, is reflected by an active EEG pattern with reduced prefrontal cortex metabolism. Patients in minimally conscious and vegetative states may show EEG anteriorization, with alpha, theta, and delta EEG patterns and decreased metabolism in the frontal cortex, striatum, and thalamus. Burst suppression in coma correlates with globally depressed metabolism. General anesthesia results in similar EEG patterns. A denotes anterior, and P posterior.

Brown EN. N Engl J Med 2010;363:2638-50

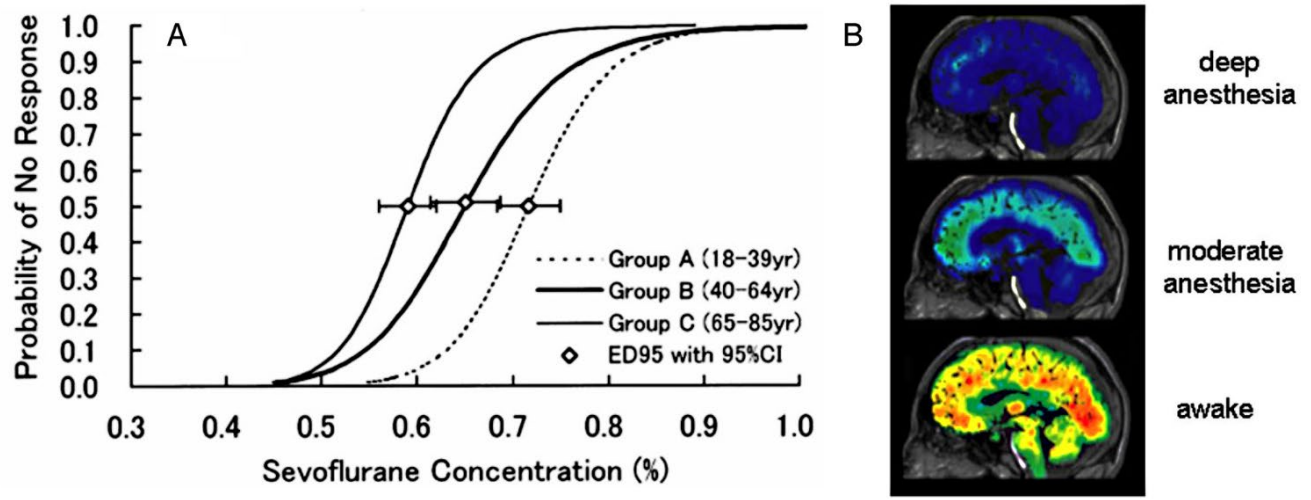


Fig. 1. Loss of consciousness with anesthesia, as assessed by behavioral output (*A*) and cerebral metabolism measured by PET (*B*). Hot colors indicate higher energy demand. [Fig. 1*A* reproduced with permission from Katoh T, Bito H, Sato S (2000) Influence of age on hypnotic requirement, bispectral index, and 95% spectral edge frequency associated with sedation induced by sevoflurane. *Anesthesiology* 92(1):55–61.] [Fig. 1*B* reprinted by permission from Macmillan Publishers Ltd: Alkire MT (2008) Probing the mind: Anesthesia and neuroimaging. *Clin Pharmacol Ther* 84:149–152, copyright 2008.]

Shulman. 11096–11101 PNAS July 7, 2009 vol. 106 no. 27

„povědomí“ / „bdělost“

vědomí sebe — vědomí okolí

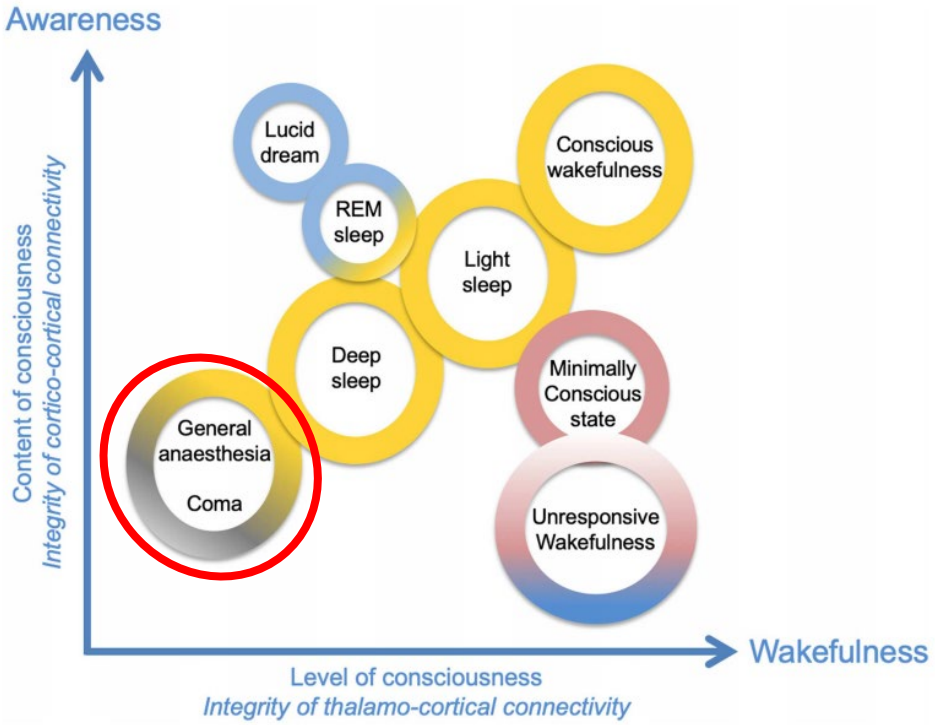


Figure 1. Wakefulness and awareness are two essential dimensions of consciousness. In this diagram, several qualitatively different states of consciousness have been positioned on the two-dimensional matrix as a function of the associated axes “content of consciousness” (awareness) and “level of consciousness” (wakefulness). Adapted from Laureys (2005).

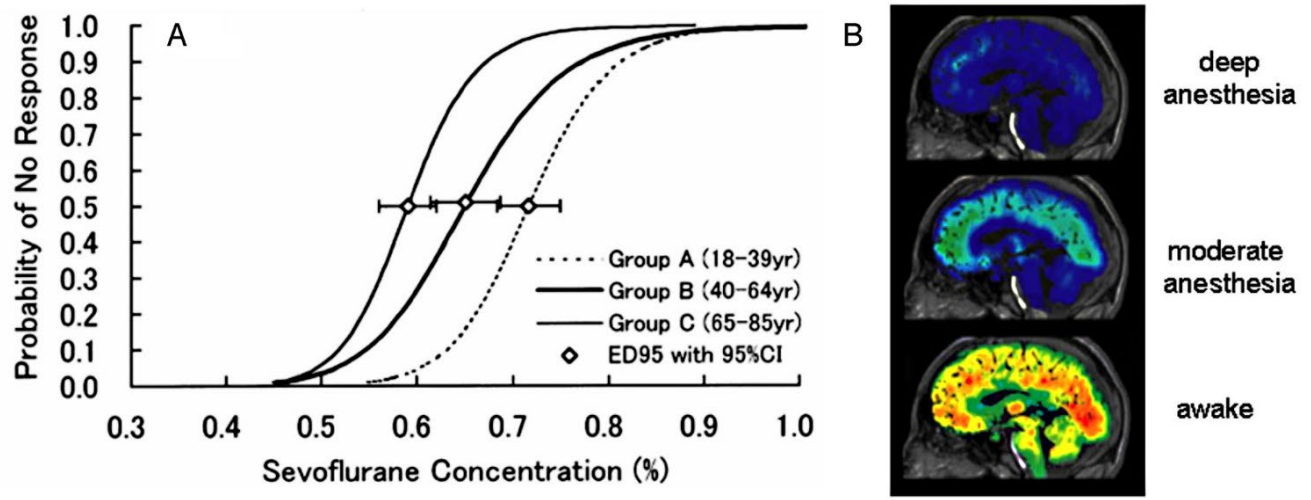
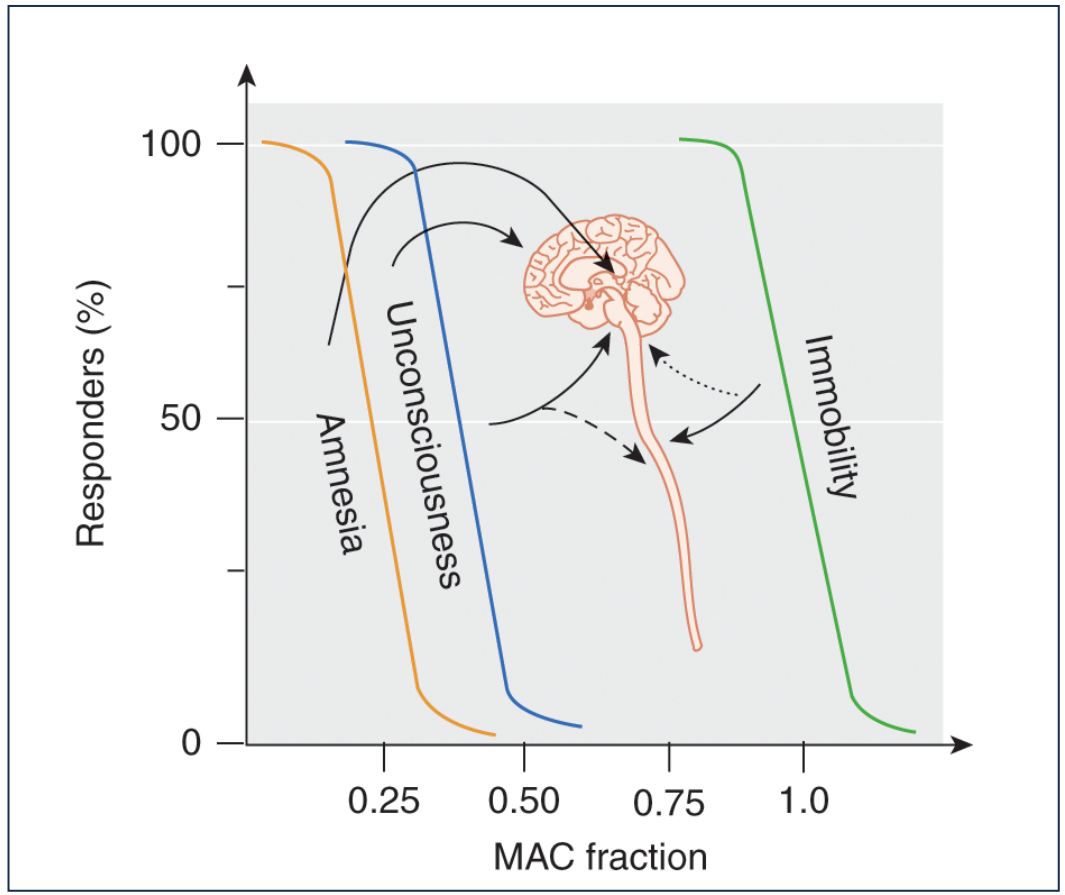


Fig. 1. Loss of consciousness with anesthesia, as assessed by behavioral output (*A*) and cerebral metabolism measured by PET (*B*). Hot colors indicate higher energy demand. [Fig. 1*A* reproduced with permission from Katoh T, Bito H, Sato S (2000) Influence of age on hypnotic requirement, bispectral index, and 95% spectral edge frequency associated with sedation induced by sevoflurane. *Anesthesiology* 92(1):55–61.] [Fig. 1*B* reprinted by permission from Macmillan Publishers Ltd: Alkire MT (2008) Probing the mind: Anesthesia and neuroimaging. *Clin Pharmacol Ther* 84:149–152, copyright 2008.]

Shulman. 11096–11101 PNAS July 7, 2009 vol. 106 no. 27



Vide et al. Anaesthesia Key

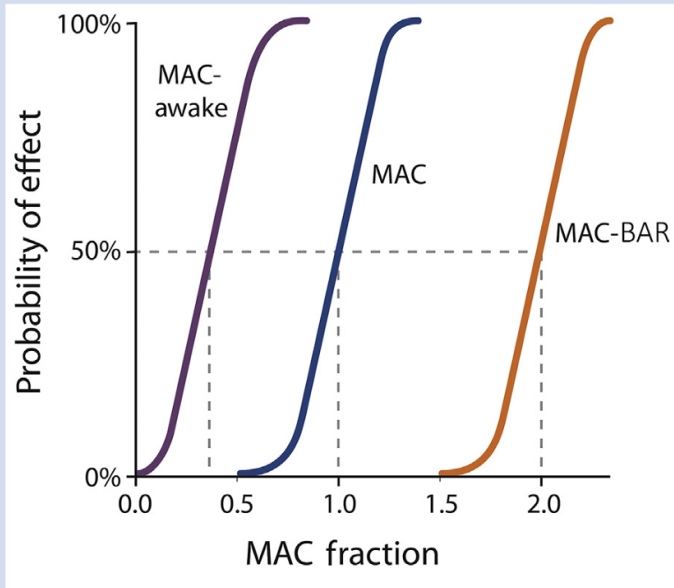


Fig 2. An idealised, graphical representation of the concentration-effect relationships of inhaled anaesthetic agents in terms of MAC, MAC-awake, and MAC-BAR. The trio of anaesthetic outcomes (deliverables) depicted follow the colour scheme introduced in Figure 1. See text for complete explanation. MAC, minimum alveolar concentration. Adapted from Egan and Svensen.[2]

Anaesthesia 2013, 68, 512–522 doi:10.1111/anae.12168

Minimum alveolar concentration: ongoing relevance and clinical utility

A. Aranake,[1] G.A. Mashour[2] and M.S. Avidan[3]

1 Washington University School of Medicine, St. Louis, Missouri, USA
2 University of Michigan Medical School, Ann Arbor, Michigan, USA

Figure 2 Relationship between anaesthetic concentration and the percent of people not moving in response to a surgical stimulus [4]. This figure illustrates the relatively narrow interperson variability in the anaesthetic concentration required to suppress movement. Factors that shift the curve to the left (i.e. decrease MAC) and to the right (i.e. increase MAC) are shown in the arrows [14]. Population effective concentrations are shown for 5% (EC_5), 50% (EC_{50}) and 95% (EC_{95}) of the population [16]. The EC_{50} is synonymous with MAC. SD, standard deviation.

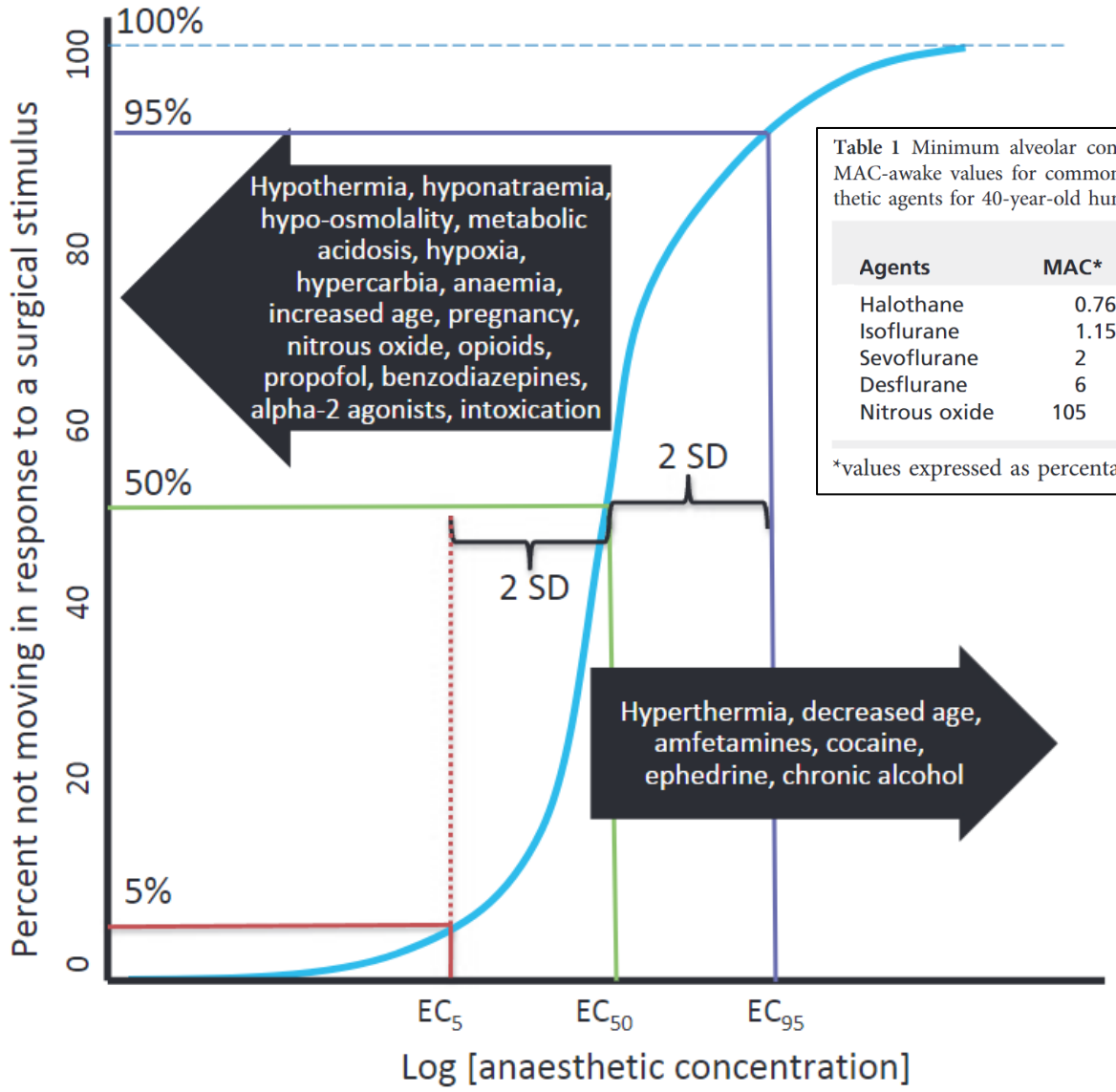
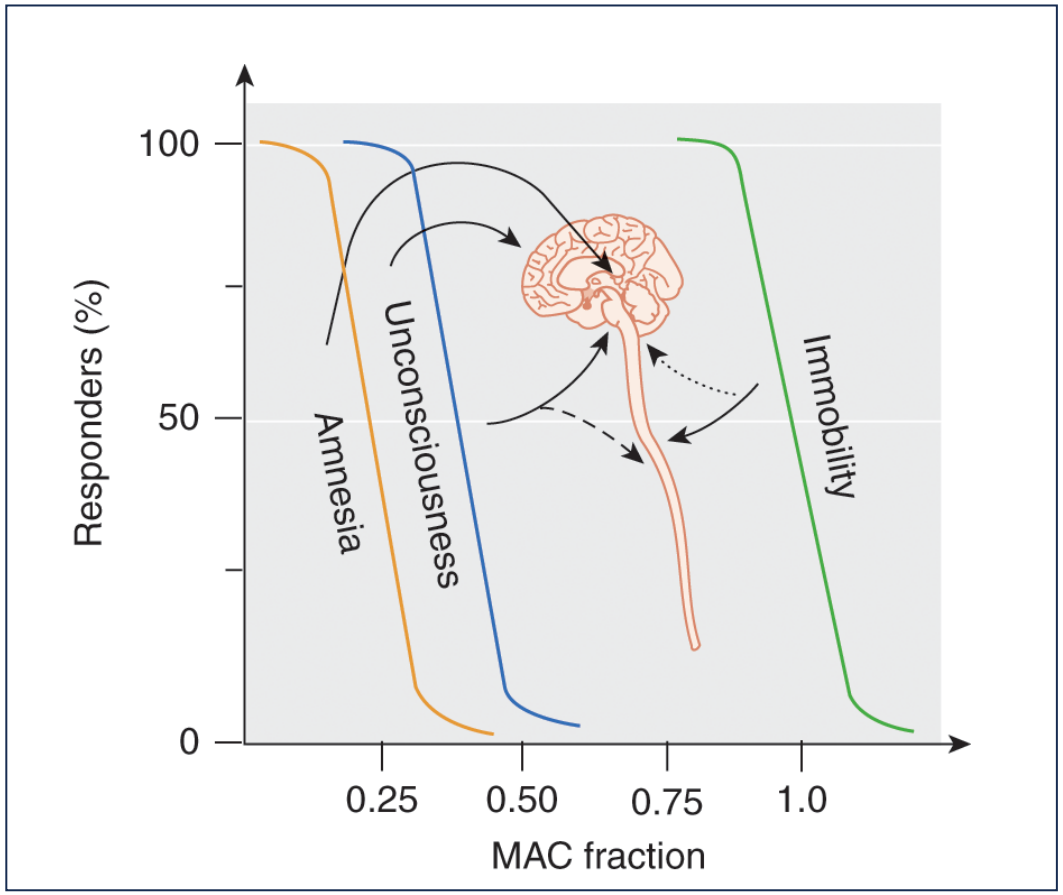


Table 1 Minimum alveolar concentration (MAC) and MAC-awake values for commonly used inhaled anaesthetic agents for 40-year-old humans.

Agents	MAC*	MAC-awake*
Halothane	0.76	0.41
Isoflurane	1.15	0.49
Sevoflurane	2	0.62
Desflurane	6	2.5
Nitrous oxide	105	68

*values expressed as percentage at 1 atmosphere.

Aranake et al. Anaesthesia 2013, 68, 512–522



Vide et al. Anaesthesia Key

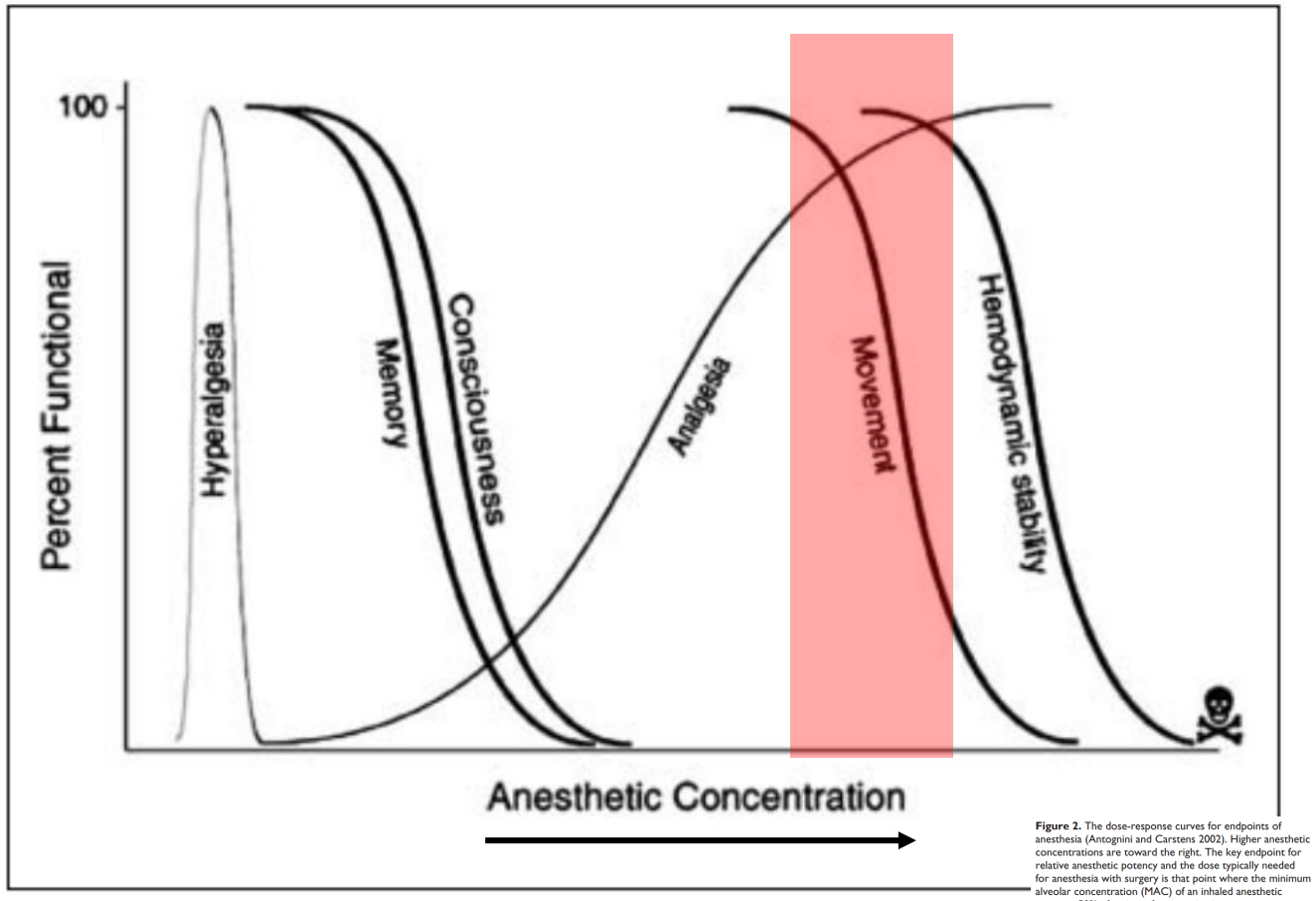


Figure 2. The dose-response curves for endpoints of anesthesia (Antognini and Carstens 2002). Higher anesthetic concentrations are toward the right. The key endpoint for relative anesthetic potency and the dose typically needed for anesthesia with surgery is that point where the minimum alveolar concentration (MAC) of an inhaled anesthetic prevents 50% of patients from moving in response to a surgical stimulus (Eger and others 1965). At very low doses of agents, typically around 0.1 MAC, a paradoxical hyperalgesia (pain-enhancing) effect occurs (Zhang and others 2000). Next, analgesia begins and increases with an increasing dose until, at much deeper levels, no movement occurs with any stimulation. The memory effects of anesthesia occur at around 0.1 to 0.3 MAC (Alkire and Gorski 2004) and deeper. Consciousness is typically lost at approximately 0.3 to 0.4 MAC, or at about 30% to 40% of the anesthetic dose actually needed for surgery. Doses much above those needed to prevent movement can cause a lethal collapse of the cardiovascular system. Adapted from Alkire and Miller (2005).

Nallasamy N. The Neuroscientist 2011. 17(1) 94–106

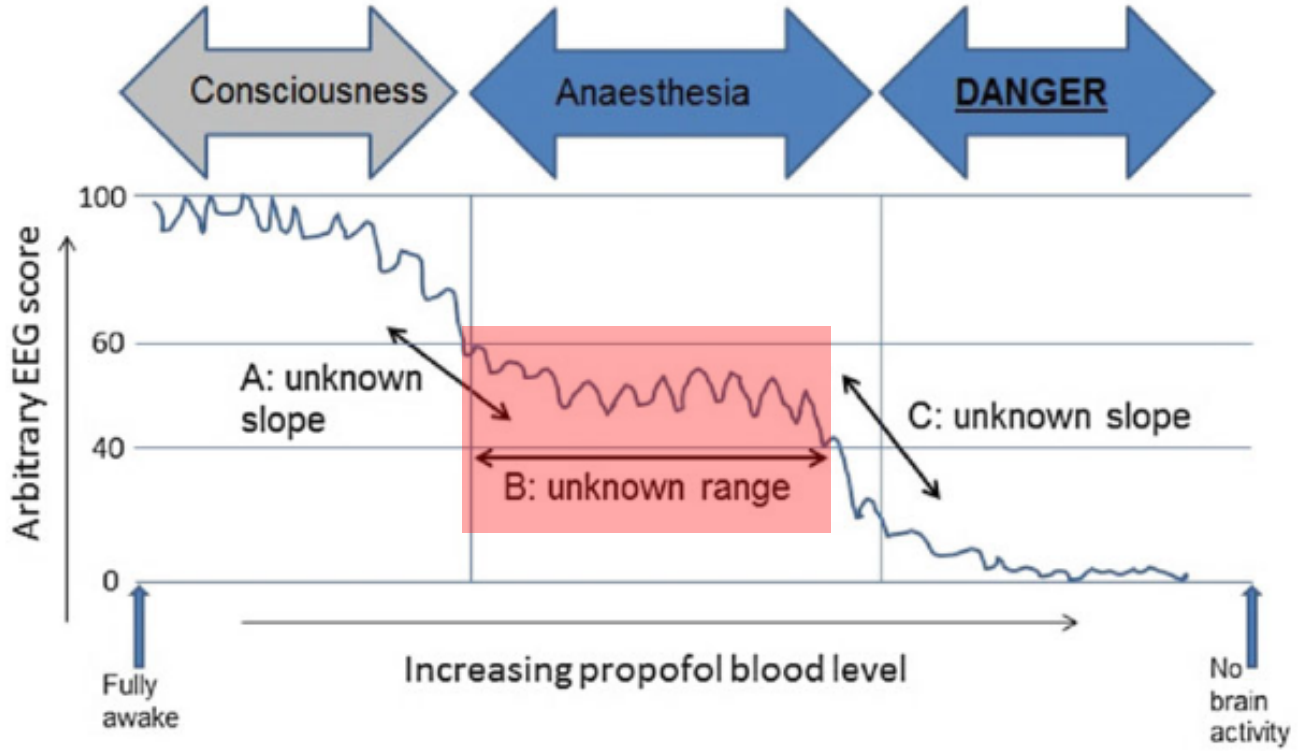


Fig. 19.5 Non-linear relationship between propofol blood level and EEG score. A probable relationship between increasing blood level of propofol and an arbitrary EEG score. For this construction it is proposed that the anaesthesia range of EEG score is between 60 and 40, and a score less than 25 may be dangerous. If these are accepted, the range of propofol blood level (B) capable of keeping an EEG score in the anaesthesia range is unknown: it may be narrow or very wide. The slopes at A and C represent the changes in EEG score leading into and out of the anaesthesia range, and these are also unknown. Similar ideas about variability of the dose response have been discussed by Escallier et al. [35]

Sury MRJ. EEG Monitoring of Depth of Anesthesia in , Total Intravenous Anesthesia and Target Controlled Infusions (2017)

Journal of Pharmacokinetics and Pharmacodynamics (2020) 47:145–161

Age progression from vicenarians (20–29 year) to nonagenarians (90–99 year) among a population pharmacokinetic/pharmacodynamic (PopPk-PD) covariate analysis of propofol-bispectral index (BIS) electroencephalography

Ashraf A. Dahaba[1] · Zhaoyang Xiao[2,3] · Peter Rehak[4] · Sieglinde Zelzer[5] · Kun Wang[6] · Gilbert Reibnegger[7]

Background Pharmacokinetic/pharmacodynamic (PK/PD) modeling has made an enormous contribution to intravenous anesthesia. Because of their altered physiological, pharmacological and pathological aspects, titrating general anesthesia in the elderly is a challenging task.

Methods Eighty patients were consecutively enrolled divided by decades from vicenarians (20–29 year) to nonagenarians (90–99 year) into eight groups. Using target controlled infusion (TCI) and electroencephalographic (EEG)-derived bispectral index (BIS) we set propofol plasma concentration (C_p) to gradually reach 3.5 μg mL^{-1} over 3.5-min. In each patient, we constructed a PK/PD model and conducted a population PK/PD (PopPK-PD) covariate analysis.

Results Age was significant covariate for baseline BIS effect (E_0), inhibitory propofol concentration at 50% BIS decline (IC_{50}) and maximum BIS decline (E_{max}). First-order rate constant K_{e0} of 0.47 min^{-1} in vicenarians (20–29 year) gradually increased with age-progression to 1.85 min^{-1} in nonagenarians (90–99 year). Simulation modelling showed that clinically recommended C_p of 3.5 μg mL^{-1} for 20–29 year BIS 50 should be reduced to 3.0 for 30–49 year, 2.5 for 50–69 year and 2.0 for 80–89 year.

Conclusion We quantified and graded EEG-BIS age-progression among different age groups divided by decades. We demonstrated deeper BIS values with decades' age progression. Our data has important implications for propofol dosing. The practical information for physicians in their daily clinical practice is using propofol C_p of 3.5 μg mL^{-1} might not yield BIS value of 50 in elderly patients. Our simulations showed that the recommended regimen of C_p 3.5 μg mL^{-1} for 20–29 year should be gradually decreased to 2.0 μg mL^{-1} for 80–89 year.

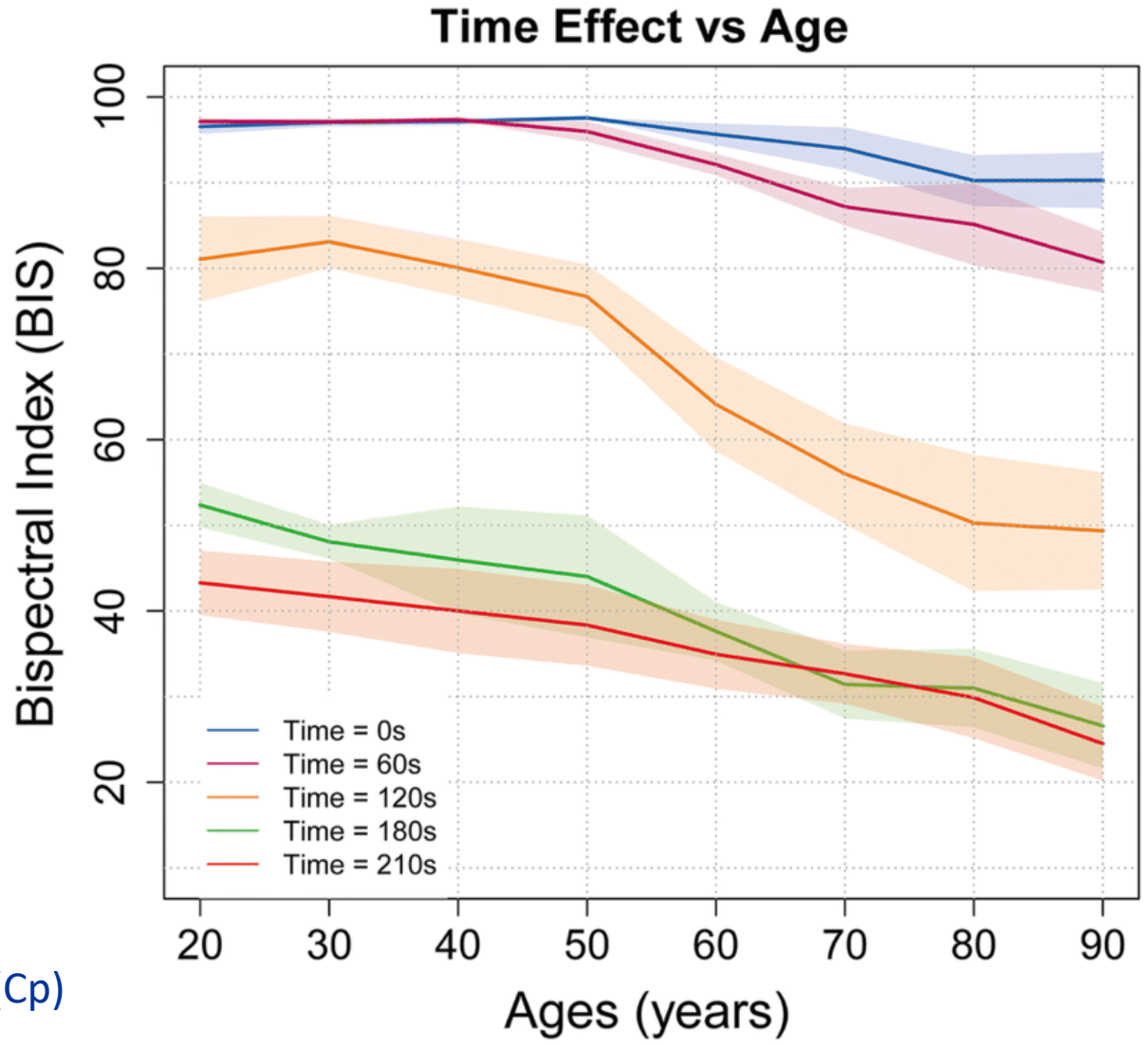


Fig. 5 Observed BIS vs Ages at different time (0, 60, 120, 180, and 210 s). The solid lines are the mean of each group. The corresponding shaded area represent 95% CI of each group

Nastavení TCI: dosažení plazmatické koncentrace propofolu (Cp) 3,5 μg/ml během 3,5 minuty.

doporučený režim Cp 3,5 μg/ml pro 20-29leté by měl být postupně snížen až na 2,0 μg/ml pro 80tileté

Dahaba et al. Journal of Pharmacokinetics and Pharmacodynamics (2020) 47:145–161

Journal of Pharmacokinetics and Pharmacodynamics (2020) 47:145–161

Age progression from vicenarians (20–29 year) to nonagenarians (90–99 year) among a population pharmacokinetic/pharmacodynamic (PopPk-PD) covariate analysis of propofol-bispectral index (BIS) electroencephalography

Ashraf A. Dahaba[1] · Zhaoyang Xiao[2,3] · Peter Rehak[4] · Sieglinde Zelzer[5] · Kun Wang[6] · Gilbert Reibnegger[7]

Background Pharmacokinetic/pharmacodynamic (PK/PD) modeling has made an enormous contribution to intravenous anesthesia. Because of their altered physiological, pharmacological and pathological aspects, titrating general anesthesia in the elderly is a challenging task.

Methods Eighty patients were consecutively enrolled divided by decades from vicenarians (20–29 year) to nonagenarians (90–99 year) into eight groups. Using target controlled infusion (TCI) and electroencephalographic (EEG)-derived bispectral index (BIS) we set propofol plasma concentration (C_p) to gradually reach 3.5 μg mL^{-1} over 3.5-min. In each patient, we constructed a PK/PD model and conducted a population PK/PD (PopPK-PD) covariate analysis.

Results Age was significant covariate for baseline BIS effect (E_0), inhibitory propofol concentration at 50% BIS decline (IC_{50}) and maximum BIS decline (E_{max}). First-order rate constant K_{e0} of 0.47 min^{-1} in vicenarians (20–29 year) gradually increased with age-progression to 1.85 min^{-1} in nonagenarians (90–99 year). Simulation modelling showed that clinically recommended C_p of 3.5 μg mL^{-1} for 20–29 year BIS 50 should be reduced to 3.0 for 30–49 year, 2.5 for 50–69 year and 2.0 for 80–89 year.

Conclusion We quantified and graded EEG-BIS age-progression among different age groups divided by decades. We demonstrated deeper BIS values with decades' age progression. Our data has important implications for propofol dosing. The practical information for physicians in their daily clinical practice is using propofol C_p of 3.5 μg mL^{-1} might not yield BIS value of 50 in elderly patients. Our simulations showed that the recommended regimen of C_p 3.5 μg mL^{-1} for 20–29 year should be gradually decreased to 2.0 μg mL^{-1} for 80–89 year.

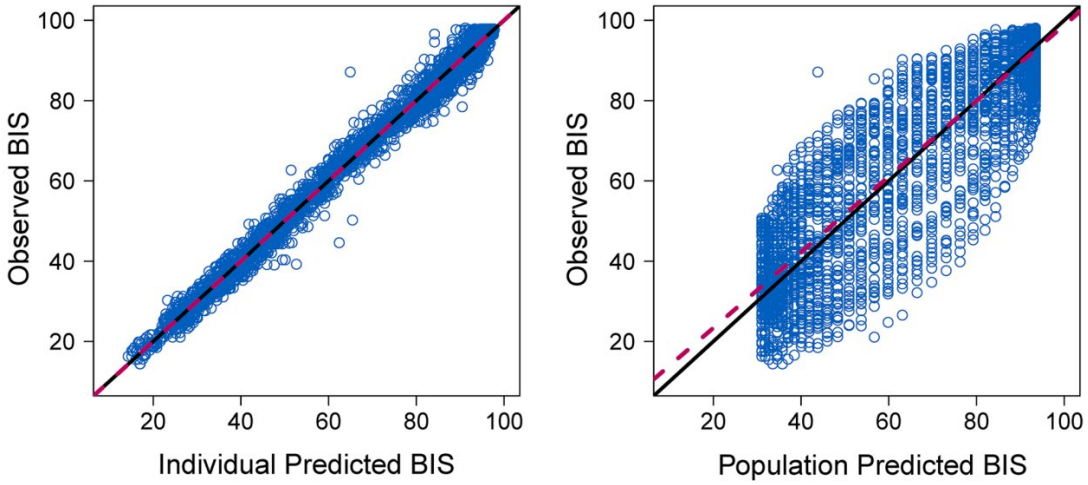


Fig. 6 Goodness of fit plot of base model. Observed versus individual predicted concentrations (left) and observed versus population predicted concentrations (right) for the final model. The solid black line in each plot is the line of identity. Points are individual data. Red dashed lines represent the regression.

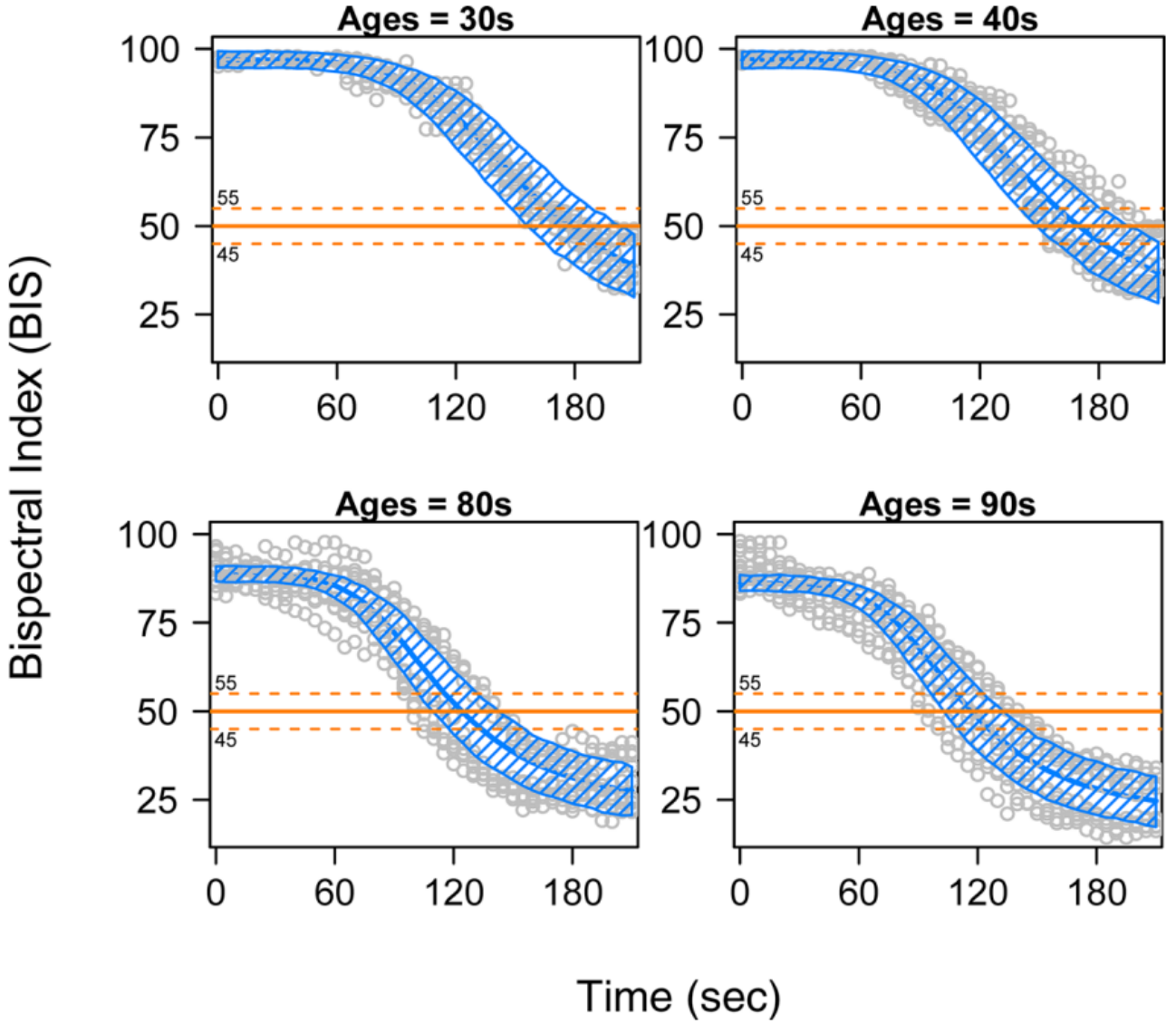


Fig. 4 Visual predictive check stratified by age groups. The circle represents the observed BIS. The thick blue lines are the median BIS of 1000 simulation of each

Wang et al. BMC Anesthesiology (2019) 19:145 https://doi.org/10.1186/s12871-019-0815-6

Variation of bispectral index in children aged 1–12 years under propofol anesthesia: an observational study

Fang Wang[1], Jianmin Zhang[1], Jie Yu[1], Muyang Tian[1], Xiaohuan Cui[1] and Anshi Wu[2*]

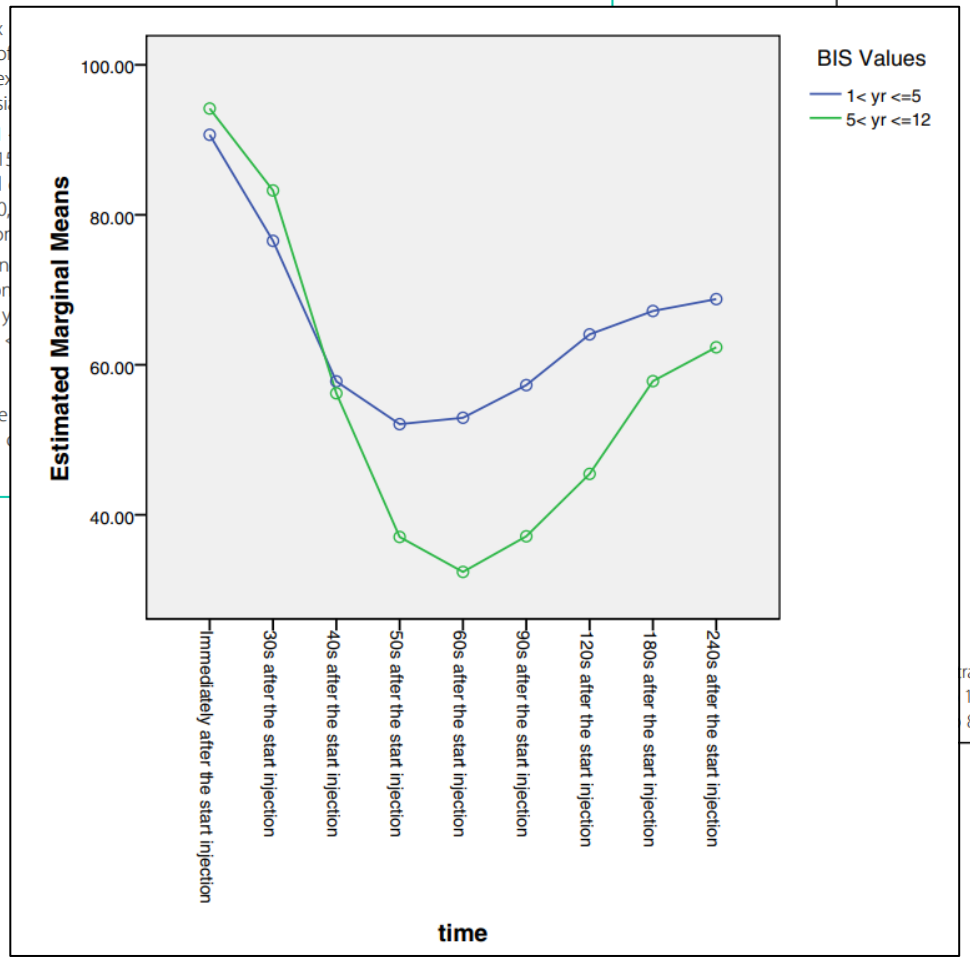
Abstract

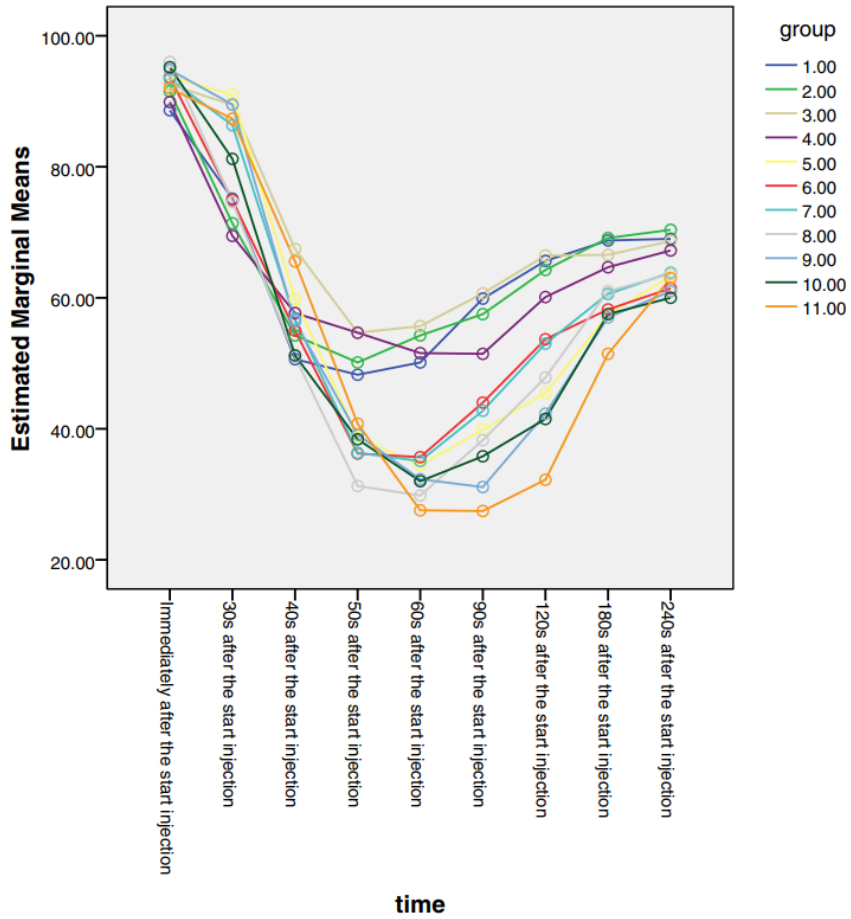
Background: The use of the bispectral index attempted to perform a detailed evaluation of anesthesia. This prospective study aimed to ex 12-year-old children under propofol anesthesi

Methods: This study enrolled 165 children (1 into 11 age groups. Of the 165 participants, 15 propofol for over 30 s. An observation period propofol injection), 30, 40, 50, 60, 90, 120, 180, corresponding to the 11 age groups were cor

Results: BIS values significantly differed amon groups ($p < 0.01$) after propofol administration groups 1–4 ($1 < yr. \leq 5$) and groups 5–11($5 < y$ to 240 s. The minimum BIS values in group 1 < and 35 ± 14, respectively.

Conclusions: During propofol anesthesia, the groups: $1 < yr. \leq 5$ and $5 < yr. \leq 12$. BIS values group at the same time points.





ral index (BIS) values according to the patient age and time point of measurement after propofol injection in children. Age
1 ($1 < yr. \leq 2$), group 2 ($2 < yr. \leq 3$), group 3 ($3 < yr. \leq 4$), group 4 ($4 < yr. \leq 5$), group 5 ($5 < yr. \leq 6$), group 6 ($6 < yr. \leq 7$), group 7 (7 <
8 ($8 < yr. \leq 9$), group 9 ($9 < yr. \leq 10$), group 10 ($10 < yr. \leq 11$), and group 11 ($11 < yr. \leq 12$)

To BIS or not to BIS

N. H. Green*

Adelaide, NSW, Australia

*E-mail: nevillegreen@optusnet.com.au

B-Aware trial (2004)
5tinásobná redukce AAGA s BIS: 0.9% vs 0.16%

B-Unaware trial
žádná změna (0.2% obě skupiny)

BAG-RECALL trial
AAGA více s BIS! (0.24% vs 0.07%)

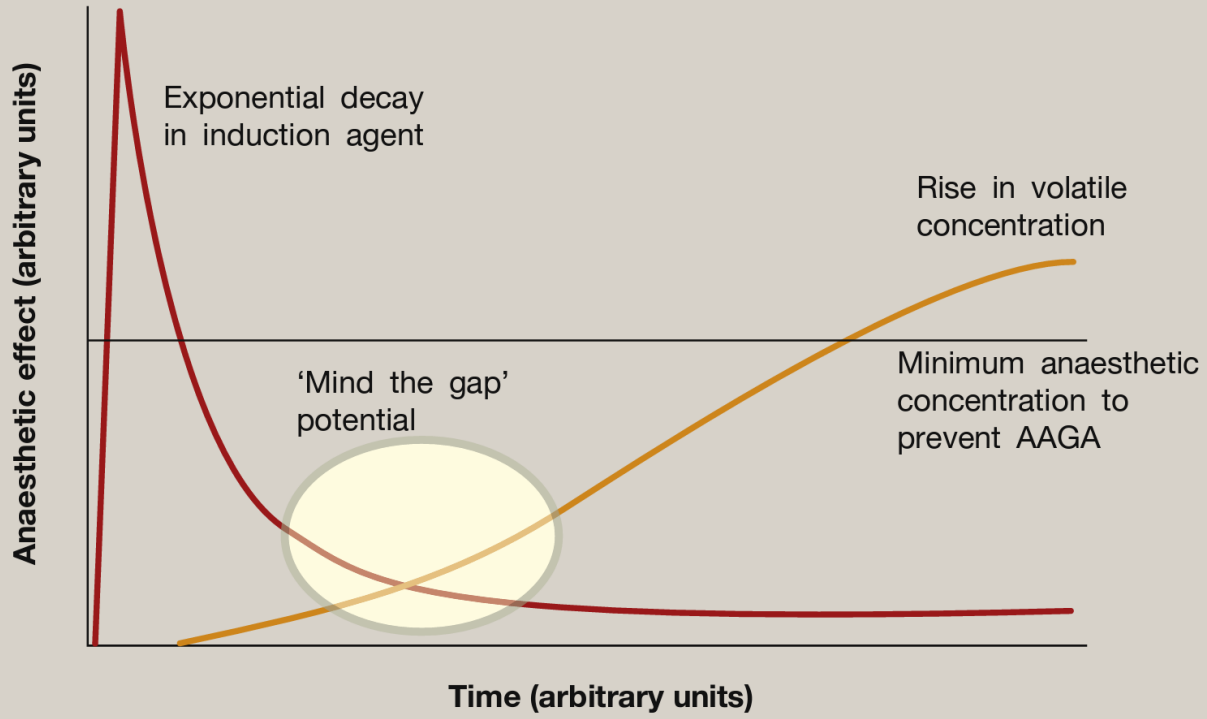
držet BIS<60 ... ale co je horší:
BIS 85 po dobu 10 sec
nebo 62 po dobu 30 min?

ALE! Většina případů AAGA vzniká při úvodu nebo krátce po něm, nebo na začátku operace.

proto používat už při úvodu !

N. Green *British Journal of Anaesthesia* (2016)

Depth of anaesthesia ‘gap’

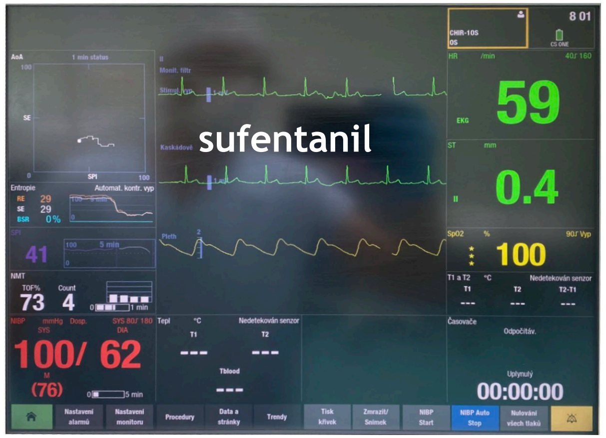


Factors increasing risk for accidental awareness under general anaesthesia

- Female gender
- Age (young adults but not children)
- Obesity
- Junior anaesthetist
- Previous AAGA
- Out of hours operating
- Emergencies
- Type of surgery (obstetric, cardiac, thoracic, neurosurgery)
- Use of NMBA
- Difficult airways

Dean Ch. RoyalCollegeofAnaesthetistsCPDMatrix:1A02,1E06,2A03


propofol


sufentanil


rocuronium

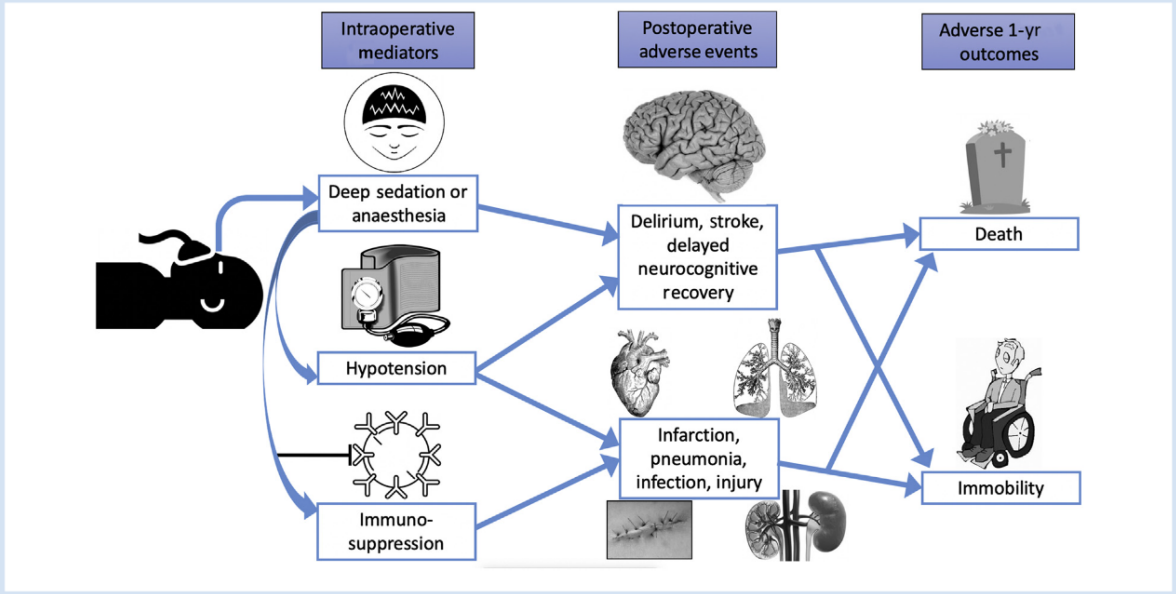


Fig 1. Deep sedation or anaesthesia and poor intermediate-term outcomes. This figure illustrates possible intraoperative mediators and postoperative adverse events associated with 'deeper' hypnosis during sedation or general anaesthesia, which could in turn increase the likelihood of intermediate-term immobility and death.

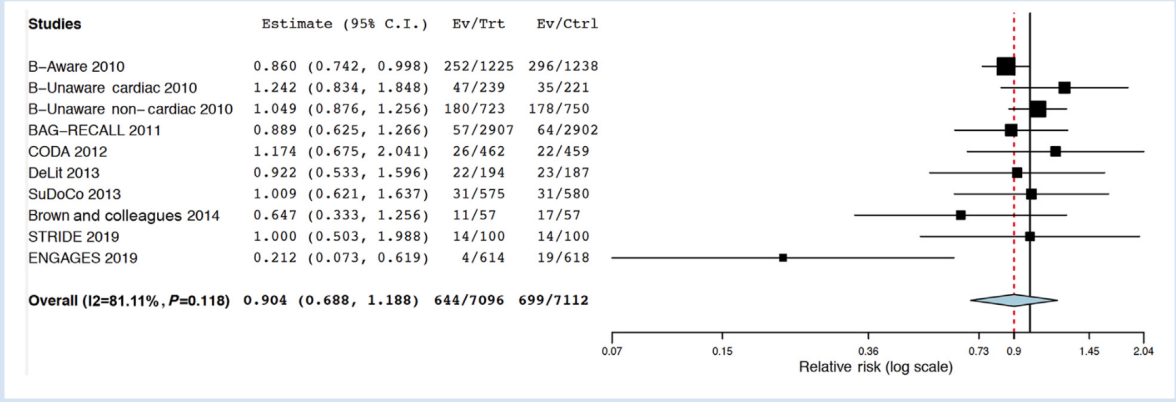


Fig 2. Meta-analysis summarising 10 trials in which the intervention group had received EEG or bispectral index (BIS) guidance, with or without the explicit goal of 'light' anaesthesia or sedation. This analysis was conducted using OpenMetaAnalyst.[22] As shown in the figure, the estimated overall risk ratio for death with the intervention (BIS-guided [reduction in] sedation/anaesthesia)=0.904 (95% confidence interval, 0.688–1.188, P=0.471).

British Journal of Anaesthesia, 122 (4): 421–427 (2019) doi: 10.1016/j.bja.2019.01.012

Hypnotic depth and postoperative death: a Bayesian perspective and an Independent Discussion of a clinical trial

Phillip E. Vlisides[1], John P. A. Ioannidis[2] and Michael S. Avidan[3,*]

[1]University of Michigan Medical School, Departme
University, Meta-Research Innovation Center,
School of Medicine, Department of Anesth

Abychom detekovali 1% pokles mortality, potřebovali bychom 27 000 pacientů !

In designing a trial to detect an absolute decrease in 1-yr mortality from 10% to 9% (10% relative reduction) with >80% power and a statistical significance level of <0.05, the trial would require 13 500 patients per group.

Yet a 1% absolute reduction in death should be considered clinically meaningful, as this would mean that for every 100 patients treated with 'lighter' anaesthesia, one life would be saved.

Vlisides et al. British Journal of Anaesthesia, 122 (4): 421e427 (2019)

Tab. 3 PRST skóre (Evansovo skóre) [15]

	Stav	Skóre
Krevní tlak (Pressure)	< + 15	0
	< + 30	1
	> + 30	2
Srdeční akce (RATE)	< + 15	0
	< + 30	1
	> + 30	2
Pocení (Sweating)	není	0
	vlhká kůže	1
	vlhká postel z pocení	2
Slzení (Tears)	nejsou slzy při otevřených očích	0
	nadbytek slz při otevřených očích	1
	plynulé slzení	2

Hodnoty v pásmu 0-3 představují dostatečnou hloubku CA.

Divák et al. Anest. intenziv. Med., 27, 2016, č. 6, s. 349–357

MED ARH 2011; 65(4): 216-220 doi: 10.5455/medarh.2011.65.216-220

Assessment of Depth of Anesthesia: PRST Score Versus Bispectral Index

Jasmina Smajic[1], Mirsada Praso[1], Mirsad Hodzic[2], Samir Hodzic[1], Nedim Smajic[2]

University Clinical Centre, Anesthesiology and Reanimatology Clinic, Tuzla, Bosnia and Herzegovina[1]
University Clinical Centre, Neurosurgery Clinic, Tuzla, Bosnia and Herzegovina[2]

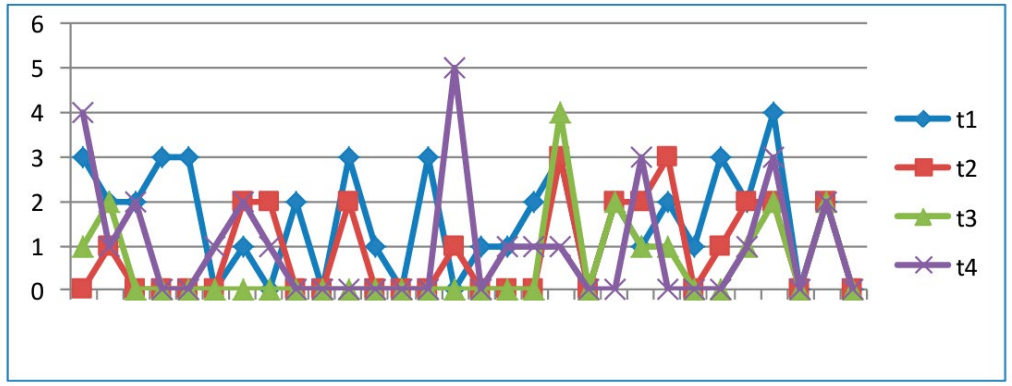


FIGURE 1. PRST scores of the first group of respondents

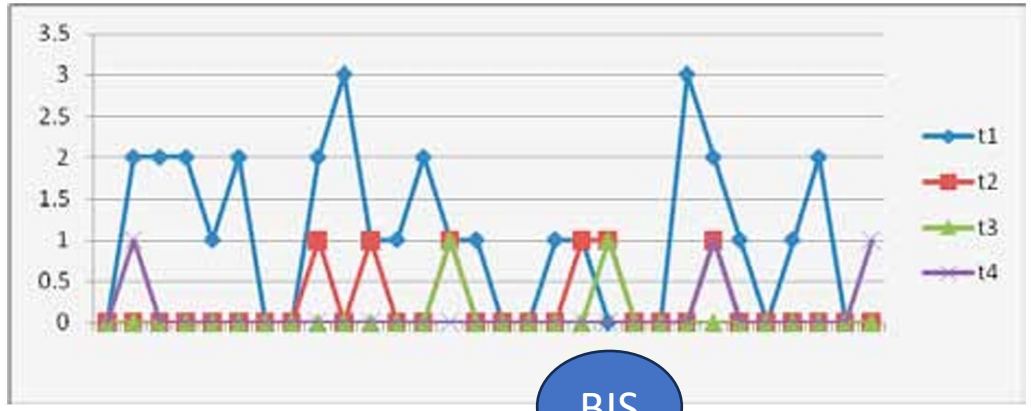


FIGURE 2. PRST scores in second group of respondents

BIS

Smajic et al. MED ARH 2011; 65(4): 216-220

Tab. 3 PRST skóre (Evansovo skóre) [15]

	Stav	Skóre
Krevní tlak (Pressure)	< + 15	0
	< + 30	1
	> + 30	2
Srdeční akce (RATE)	< + 15	0
	< + 30	1
	> + 30	2
Pocení (Sweating)	není	0
	vlhká kůže	1
	vlhká postel z pocení	2
Slzení (Tears)	nejsou slzy při otevřených očích	0
	nadbytek slz při otevřených očích	1
	plynulé slzení	2

Hodnoty v pásmu 0-3 představují dostatečnou hloubku CA.

Divák et al. Anest. intenziv. Med., 27, 2016, č. 6, s. 349–357

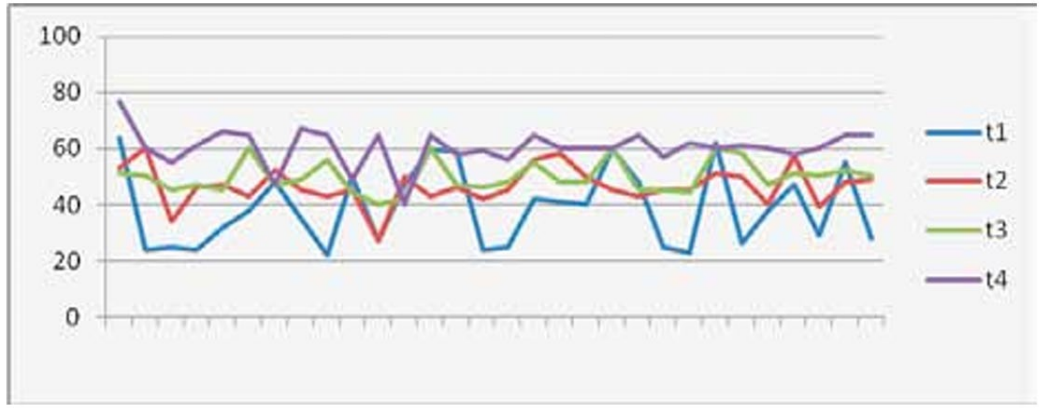
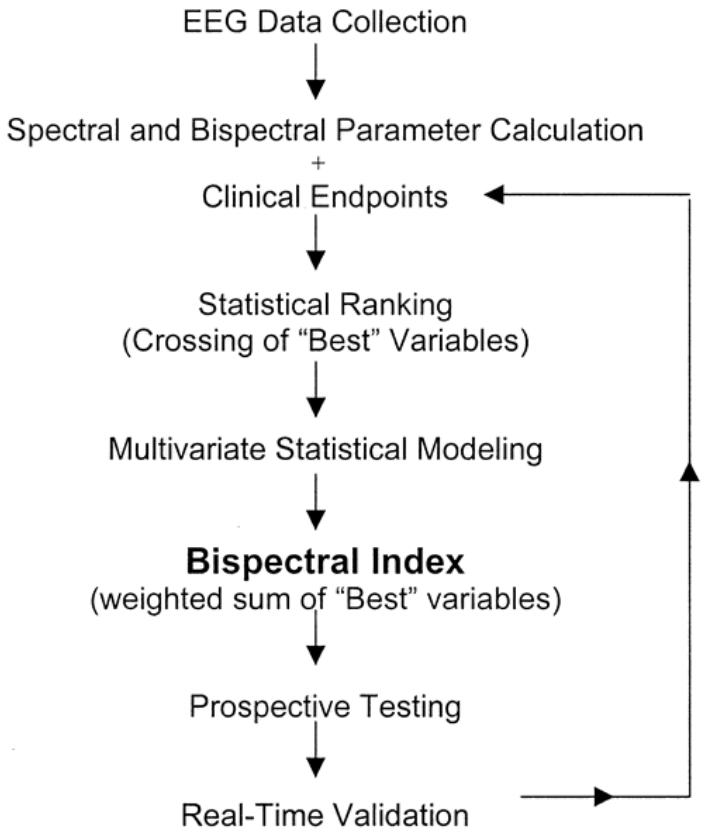


FIGURE 4. BIS index in group 2 during general anesthesia

Anesthesiology 2000; 93:1336–44

Development and Clinical Application of Electroencephalographic Bispectrum Monitoring

Jay W. Johansen, M.D., Ph.D., Peter S. Sebel, M.B., B.S., Ph.D., M.B.A.†*



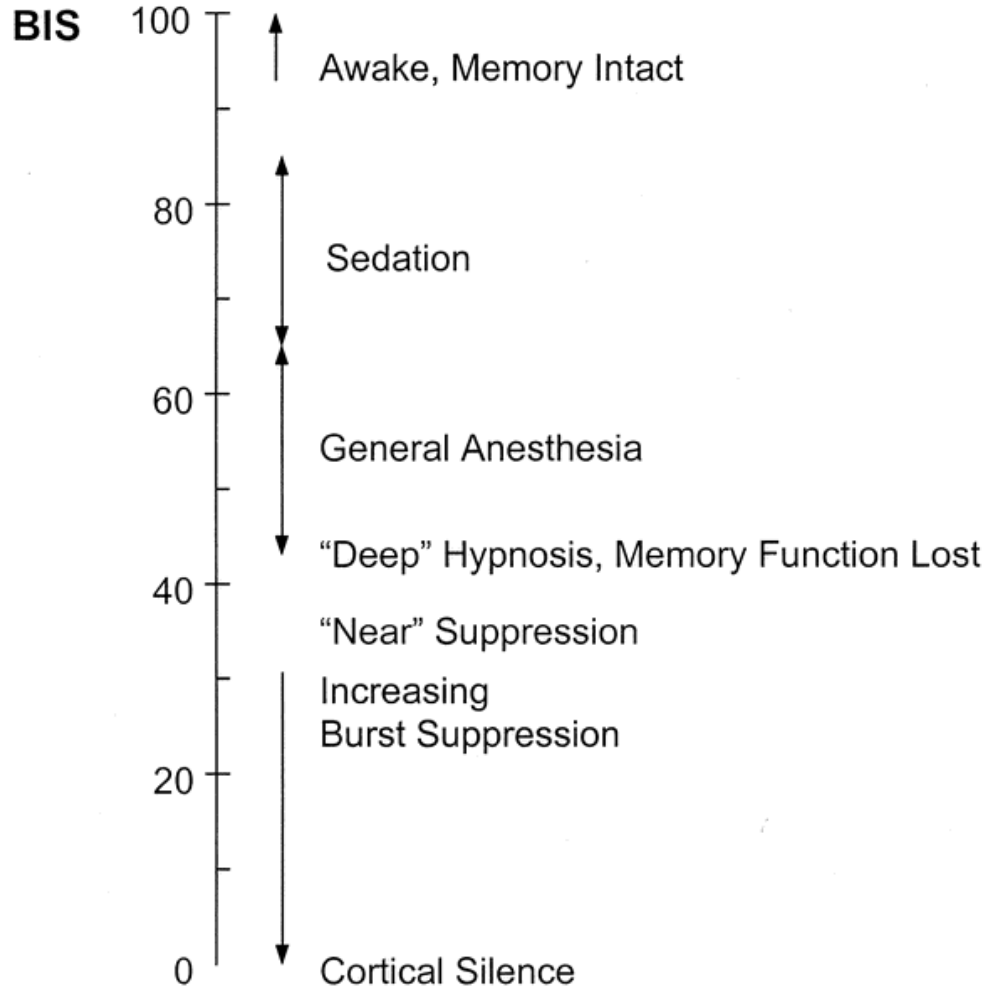


Fig. 1: The Bispectral Index Scale (BIS versions 3.0 and higher) is a dimensionless scale from 0 (complete cortical electroencephalographic [EEG] suppression) to 100 (awake). BIS values of 65–85 have been recommended for sedation, whereas values of 40–65 have been recommended for general anesthesia. At BIS values lower than 40, cortical suppression becomes discernible in raw EEG as a burst suppression pattern.

Data Driven Investigation of Bispectral Index Algorithm

Hyung-Chul Lee, Ho-Geol Ryu, Yoonsang Park, Soo Bin Yoon, Seong Mi Yang, Hye-Won Oh & Chul-Woo Jung

	All (n = 5,427)	Training (n = 4,342)	Test (n = 1,085)	*P*-value
Age (years)	59 (49–69)	59 (49–68)	59 (49–69)	0.256
Sex (male/female)	2,708/2,719	2,172/2,170	536/549	0.745
Height (cm)	162 (156–168)	162 (156–169)	162 (156–168)	0.492
Weight (kg)	61 (53–69)	61 (54–69)	60 (53–69)	0.129
Anaesthesia Type				0.713
Total intravenous	2,558 (47%)	2,052 (47%)	506 (47%)	
Volatile	943 (17%)	760 (17%)	183 (17%)	
Balanced	1,930 (36%)	1,533 (35%)	397 (37%)	
Surgery duration (min)	120 (71–200)	120 (65–195)	125 (71–200)	0.113
Anaesthesia duration (min)	165 (105–250)	165 (100–245)	170 (105–250)	0.106

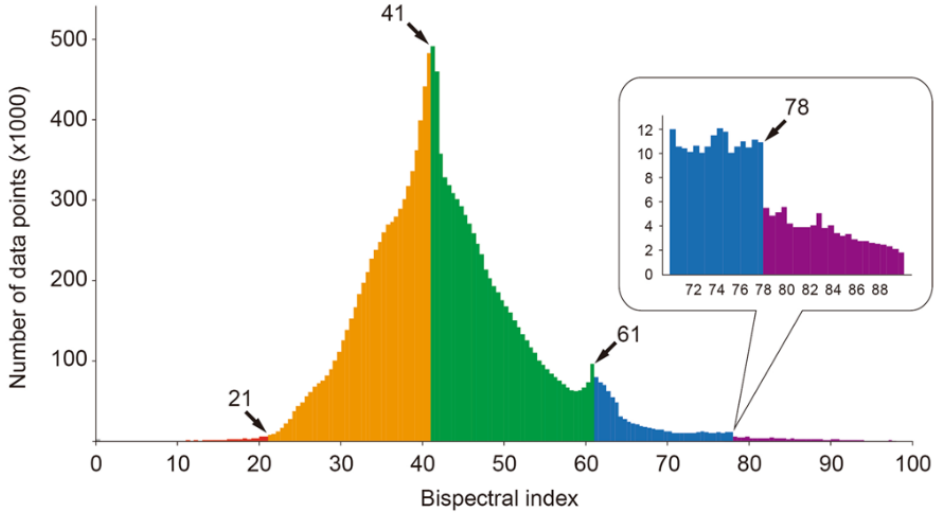


Figure 1. Histogram of bispectral index. The histogram from the entire dataset shows unusual data distribution at the bispectral index values 41, 61 and 78.

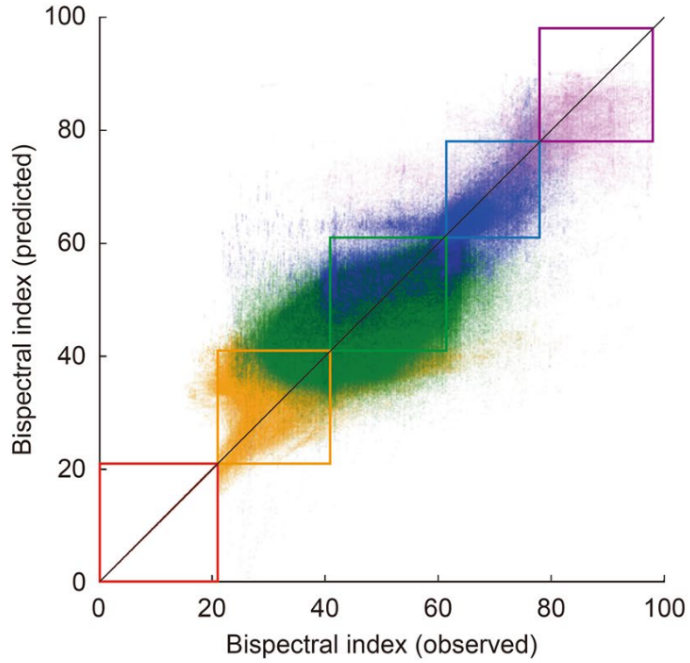


Figure 3. Observed *vs* model-predicted bispectral index. The scatter plot represent the agreement between the observed and the model-predicted bispectral index values in the test dataset.

The majority of data points are located along the line of identity and within the designated bispectral index ranges (average positive predictive value = 89%).

Data Driven Investigation of Bispectral Index Algorithm

Hyung-Chul Lee, Ho-Geol Ryu, Yoonsang Park, Soo Bin Yoon, Seong Mi Yang, Hye-Won Oh & Chul-Woo Jung

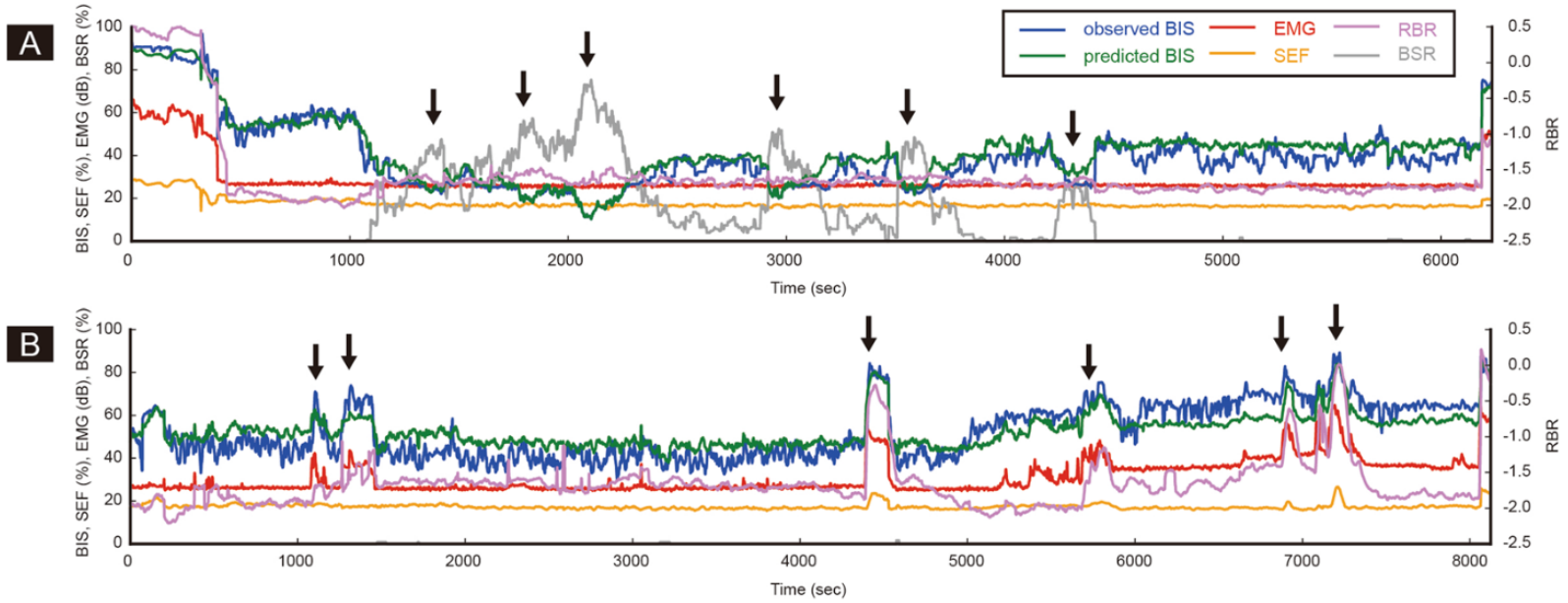


Figure 4. Typical examples of unusual bispectral index values during surgery. Two typical cases where BIS values are affected by specific electroencephalographic subparameters are presented. (**A**) The BIS is mainly determined by the level of BSR (arrow). (**B**) Sudden increase of EMG causes an unexpected peak of the BIS (arrow). In both cases, our model well estimates the measured BIS values. Abbreviations: BIS = bispectral index, BSR = burst suppression ratio, EMG = power of electromyography, RBR = relative beta ratio, SEF = 95% spectral edge frequency.

Effect of Change of Position (Supine vs. Steep Trendelenburg) on Bispectral Index Value During Robotic Surgery

Sachin Kumar [1], Rohit Balyan [2], Arjun Nair [2], Rajesh Tope [3], Vijay Kumar [3], Tulika Shrivastava [3], Rajni Kalia [5], Jasleen Kaur [6]

DOI: 10.7759/cureus.29180 **Published** 09/15/2022

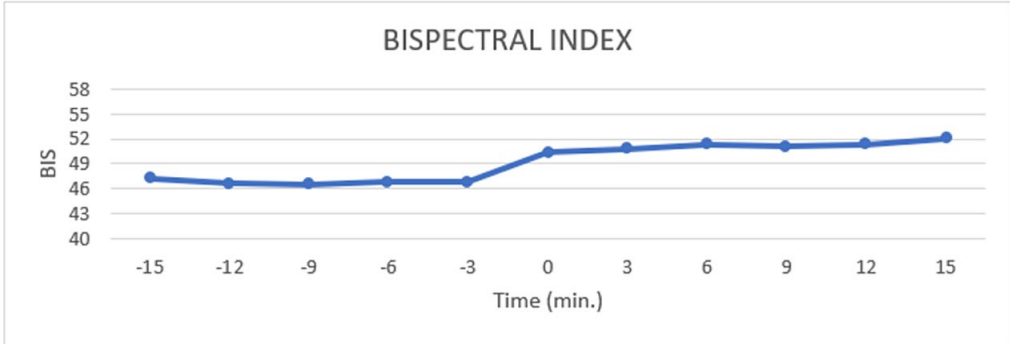


FIGURE 1: Bispectral index trend at the 3-minute interval before and after Trendelenburg position. 0 min. shows value just after Trendelenburg's position

	Before Trendelenburg	After Trendelenburg	
	Mean ± SD		P value
HR	70.82±9.33	70.36±9.73	0.123
SBP	120.88±12.24	121.23±12.25	0.235
MAP	89.93±9.41	90.45±9.14	0.102
BIS	46.83±4.10	51.01±4.18	<0.01
EtDE	6.21±0.33	6.21±0.33	0.963

Conclusions

In this study, we observed a change in BIS value from 46 to 52 with the change in position. This change was significant but was not associated with any signs of light anesthesia. The rise in BIS values with Trendelenburg position was probably because of position-related effects on cerebral blood flow and cerebral electrical activity. The use of BIS in surgeries involving Trendelenburg positioning might raise a false alarm showing the patient going in a light plane of anesthesia when a position is changed from supine to Trendelenburg. This should be kept in mind while using BIS to monitor the depth of anesthesia for correct interpretation.

Korean J Anesthesiol 2014 October 67(4): 235-239

Effect of beach chair position on bispectral index values during arthroscopic shoulder surgery

Sang Wook Lee[1], Soo Eun Choi[2], Jin Hee Han[1], Sung-Wook Park[1], Wha Ja Kang[1], and Young Kyoo Choi[1]

Department of Anesthesiology and Pain Medicine, [1]Kyung Hee University Medical Center, [2]Korea University Anam Hospital, Seoul, Korea

Conclusions: BIS values are significantly decreased in the beach chair position compared with the neutral position and might affect interpretation of the depth of anesthesia.

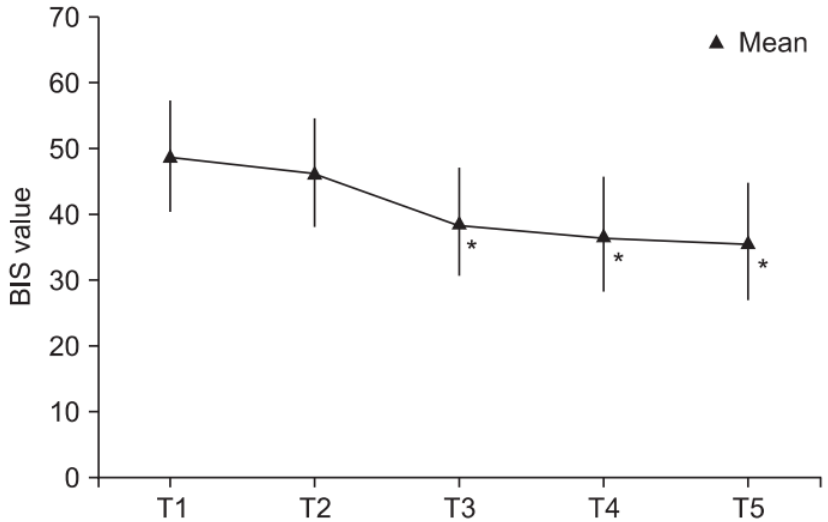


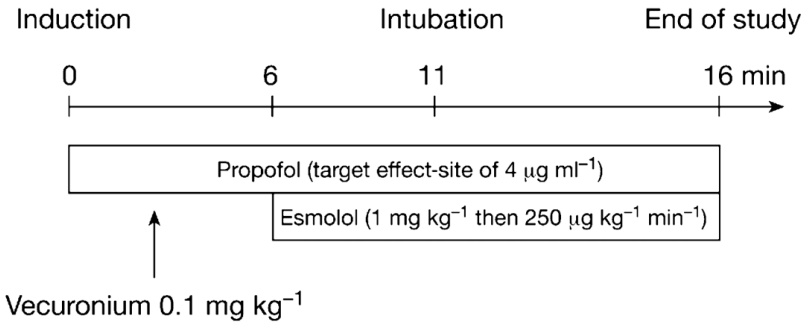
Fig. 1. Changes in bispectral index values in relation to changes in patient position. T1: 5 minutes after induction in supine position, T2: 10 minutes after induction in supine position, T3: 5 minutes after sitting position, T4: 10 minutes after sitting position, T5: 15 minutes after sitting position. *P < 0.01 compared to

British Journal of Anaesthesia 89 (6): 857–62 (2002)

Esmolol prevents movement and attenuates the BIS response to orotracheal intubation

C. Menigaux[1], B. Guignard[1], F. Adam[1], D. I. Sessler[2], V. Joly[1] and M. Chauvin[1]*

[1]Département d'Anesthésie-Réanimation, Ambroise Pare Hôpital, Boulogne-Billancourt, France; [2]Outcomes Research® Institute and Department of Anesthesiology, University of Louisville, Kentucky, USA; Ludwig Boltzmann Anesthesia Institute, University of Vienna, Austria



In conclusion, esmolol had no significant effect on BIS before laryngoscopy and orotracheal intubation in patients anaesthetized with propofol. However, it not only attenuated the haemodynamic responses, but also prevented movement and BIS increases in response to laryngoscopy and orotracheal intubation. These results suggest that esmolol may produce a clinically important antinociceptive effect.

It seems likely that esmolol has no anaesthetic effect *per se*; instead, it acts mainly via β-adrenergic block and is thus effective only during sympathetic activation. These results are consistent with a recent study reporting that the propofol blood concentration preventing response to command was unaltered by esmolol.

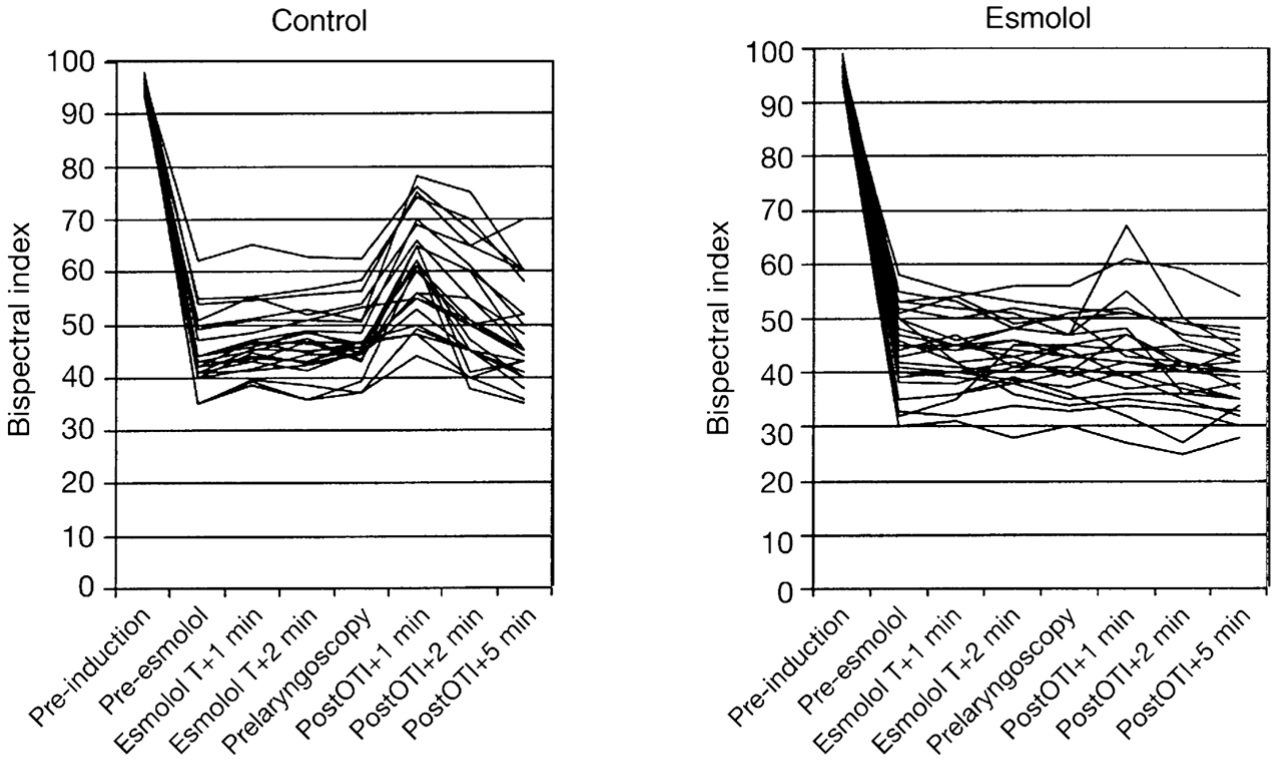


Fig 2 Individual bispectral index values: before induction; 1 min before esmolol, 1, 3 and 5 mins (pre-laryngoscopy) after the start of esmolol infusion; and 1, 2 and 5 min after orotracheal intubation (OTI).

J Neurocrit Care 2018;11(1):39-42

Sudden Bispectral Index Reduction and Suppression Ratio Increase Associated with Bradycardia in a Patient Undergoing Breast Conserving Surgery

Youngheun Jo, MSc[1,2], Jae-Man Kim, BSc[1], Sang-Beom Jeon, MD[2], Se-Ung Park, MD[1], Hye-Jin Kam, PhD[3], Woo-Hyun Shim, PhD[3], Sung-Hoon Kim, MD[1,3]

Departments of [1]Anesthesiology and Pain Medicine, [2]Neurology, Asan Medical Center, University of Ulsan College of Medicine, Seoul; [3]Health Innovation Bigdata Center, Asan Institute for Lifesciences, Asan Medical Center, Seoul, Korea

Conclusion: The patient recovered from anesthesia without showing any signs of neurological sequelae based on BIS level monitoring.

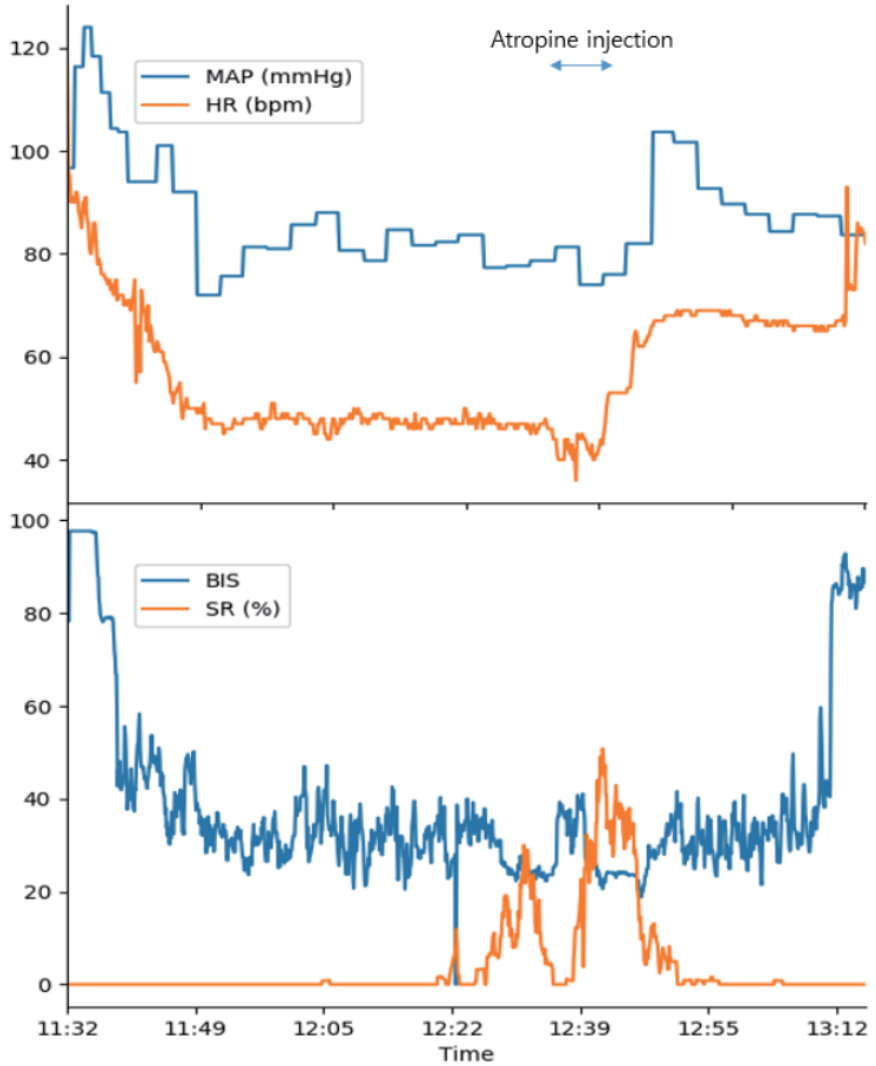


Figure 1. A sudden decrease in bispectral index (BIS) and increase in suppression ratio (SR) accompanied by severe bradycardia (35 beats per minute). After atropine infusion (double-headed blue arrow), BIS and heart rate (HR) levels recovered to levels prior to surgery. MAP, mean arterial pressure.

British Journal of Anaesthesia 2015, i95–i103 ARTICLE doi: 10.1093/bja/aev072

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

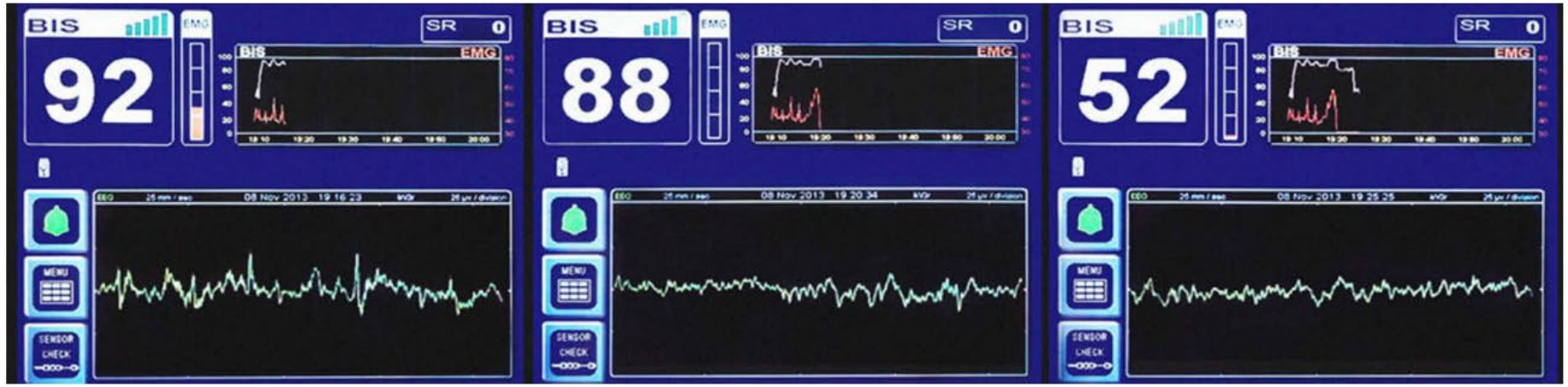


Fig 5 BIS Vista screen capture during one suxamethonium trial (Subject 1). The BIS Vista screenshots were made 3 min before, 1 min after and 6 min after administration of suxamethonium. The duration of each screen is 4 s, and the screen amplitude is +50 to −50 μV. The EEG waveform is typical of an awake subject throughout the experiment. Note the presence of EMG in the leftmost screen, where the waveform shows the characteristic high-frequency spikes of muscle activity superimposed on the underlying cortical EEG. After neuromuscular block, the EMG activity is absent but the EEG is otherwise unchanged. Examples of the multi-channel raw EEG are available in the Supplementary material.

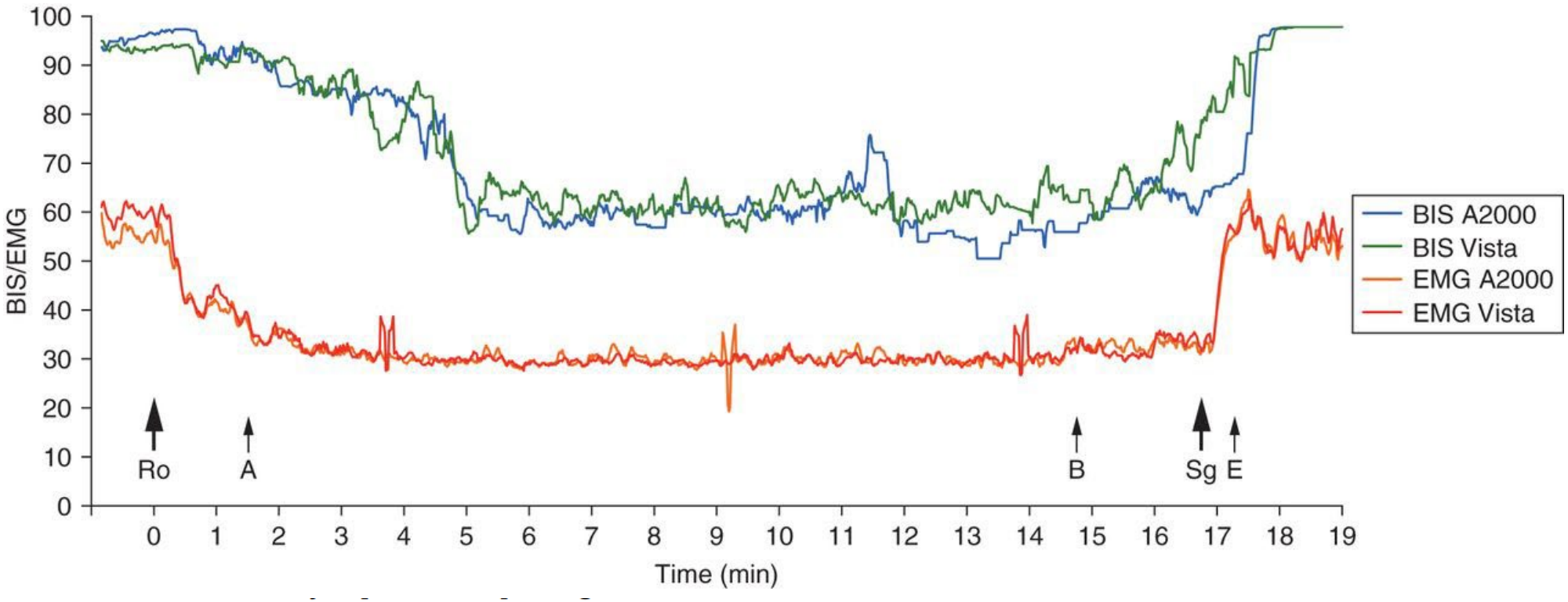
Schuller et al. British Journal of Anaesthesia 2015, i95–i103

British Journal of Anaesthesia 2015, i95–i103 ARTICLE doi: 10.1093/bja/aev072

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



Conclusions: These results suggest that the BIS monitor requires muscle activity, in addition to an awake EEG, in order to generate values indicating that the subject is awake. Consequently, BIS may be an unreliable indicator of awareness in patients who have received neuromuscular blocking drugs.

Schuller et al. British Journal of Anaesthesia 2015, i95–i103

Is BIS Monitoring Cost-Effective?

J.P. Abenstein, *Mer*

Rozhodnutí na používání BIS by mělo být na každém anesteziologovi, u kterých – rizkových – pcientů jej použije

V. Conclusion

The incidence of any kind of intraoperative recall, as reported in the literature, is relatively low, with an incidence of 0.1% to 0.2%. BIS monitoring may reduce this incidence. General use of BIS monitoring to reduce the incidence of IR would cost about $10,000 to 25,000 per avoided IR. Total cost to the heath care system would approach one billion US dollars per year, just for use during general anesthetics.

The decision to use BIS monitoring is best left to individual physicians and the health care facilities where they work. Individual patients who are at high risk for IR may benefit from this technology. However, based on current health care economic standards general use of BIS monitoring does not seem warranted and appears not to be cost-effective.

Abenstein. Annu Int Conf IEEE Eng Med Biol Soc . 2009;2009:7041-4

Cost-Effectiveness of a Practice Change

Costs	Patient Outcomes		
	Better	Same	Worse
Higher	maybe	NO	NO
Same	YES	maybe	NO
Lower	YES	YES	maybe

Figure 1: Cost-effectiveness relationship of patient outcomes and cost implications of a practice change. This relationship holds true whether the change is a new drug, procedure, diagnostic strategy, or technology.

Avoided recall with BIS monitoring	**$11,294 – $25,814**
CABG for left main disease *	**$8,768**
3-Drug Treatment for HIV§	**$13,000 - $23,000**
PAP Smear Screening*	**$24,011**
Breast Cancer Screening (55-65 yrs)*	**$41,008**
Neonatal ICU (500-999 grams)*	**$77,161**

Cost of avoiding intraoperative recall with BIS monitoring as compared to the cost, in U.S. dollars-per-life-year-saved of accepted medical interventions.

"A real-world evidence" in reduction of volatile anesthetics by BIS-guided anesthesia

Yan-Yuen Poon[1,3], Han-Chen Chang[1,3], Min-Hsien Chiang[1], Kuo-Chuan Hung[2], Hsiao-Feng Lu[1], Jo-Chi Chin[1] & Shao-Chun Wu[1]✉

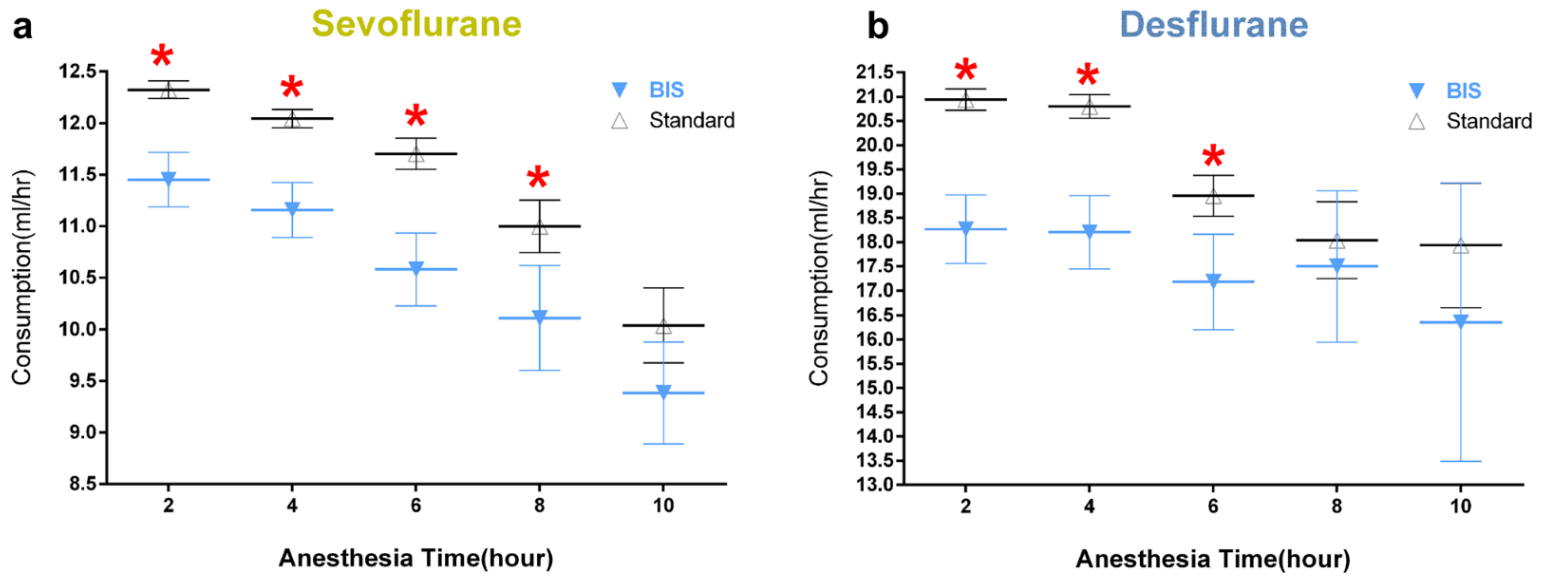


Figure 3. Indicate hourly consumption of BIS guided and Standard practice group in sevoflurane (**a**) or desflurane (**b**) in 5 groups of anesthesia time.

Age (years)	BIS (mL/h)	Standard practice (mL/h)	*P*
Sevoflurane			
21–40	10.8 (8.8–13.6)	12.7 (10.2–16.0)	< 0.001
41–60	10.9 (8.9–13.5)	11.8 (9.4–14.9)	< 0.001
61–80	10.3 (8.4–12.6)	10.6 (8.5–13.5)	0.032
> 80	9.6 (7.7–11.9)	8.9 (7.4–11.2)	0.461
Desflurane			
21–40	18.2 (14.3–22.2)	22.0 (17.4–27.7) (n	< 0.001
41–60	17.1 (13.5–21.1)	21.1 (16.6–25.5) (n	< 0.001
61–80	17.6 (14.0–21.0)	18.6 (15.0–23.1) (n	0.095
> 80	11.8 (10.2–16.0)	16.2 (12.2–19.6) (n	0.053

Table 3. Consumption of volatile anesthetic guided by BIS or Blood pressure by age. Data were expressed as median (25%-75% interquartile values).

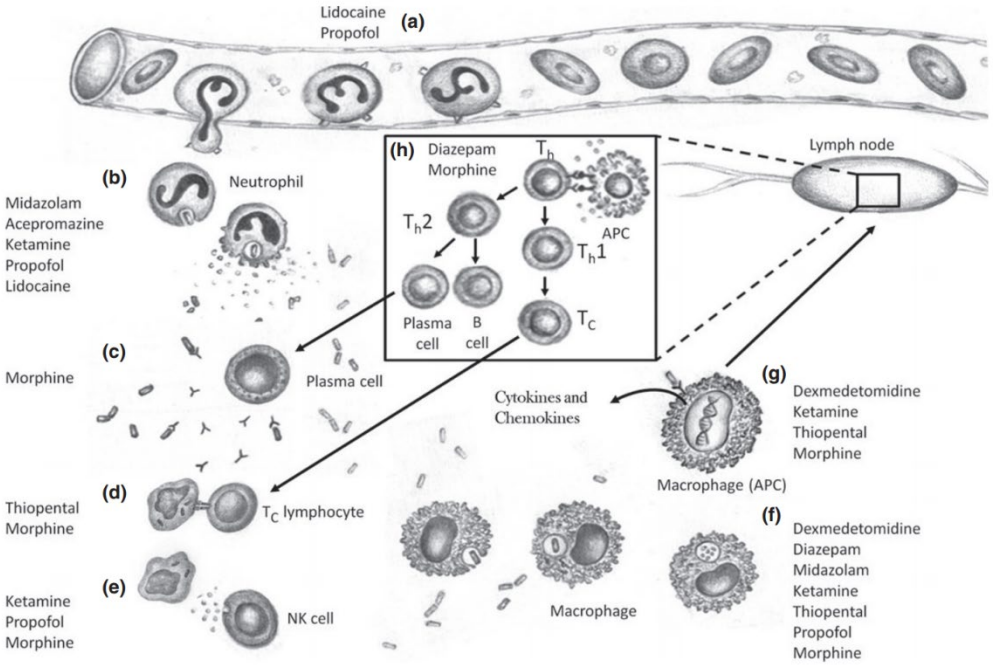


Figure 1 The immunomodulatory effects of injectable anesthetic drugs as described in Table 1 on the immune response to microbial invasion. (a) Extravasation of a neutrophil. Neutrophils roll (mediated by selectins), tether (mediated by E-selectin), and adhere to endothelial cells (mediated by intracellular adhesion molecules, ICAM), then diapedese between endothelial cells (mediated by platelet endothelial cell adhesion molecule, PECAM) out of the blood vessels. (b) Neutrophils phagocytose pathogens and produce reactive oxygen species (ROS). (c) Plasma cells release antibodies to neutralize antigens. (d) Cytotoxic T lymphocytes (T_C) recognize non-self or stress peptides presented by infected or dysfunctional cells, respectively, on their major histocompatibility complex 1 (MHC1) receptors. Once an abnormal cell is recognized, the T_C lymphocyte releases cytotoxins to induce apoptosis, resulting in the cell's death. (e) Natural killer (NK) cells function similarly to T_C lymphocytes, however, they can recognize abnormal cells with or without presentation on the MHC1 receptors. (f) Macrophages phagocytose pathogens and kill them in phagosomes via respiratory burst. (g) Macrophages recognize non-self molecular patterns with pattern recognition receptors leading to activation of intracellular signaling, upregulation of appropriate gene expression (e.g. nuclear factor kappa B (NFκB) pathway), and release of chemokines and cytokines. (h) Antigen presenting cells (APC), such as macrophages, travel through the lymph to a lymph node where they present their antigen to naïve T helper (T_h) cells. A T_h1 response results in the production of cytotoxic T cells (T_C) to generate a cell-mediated response. A T_h2 response results in the production of B cells and plasma cells to generate a humoral or antibody-mediated response.

Table 1. In vitro effects of anaesthetic agents used in general anaesthesia.

Agent	In vitro effects	References
Thiopental	Inhibits bactericidal functions of leukocytes	Krumholz et al[12]
	Inhibits neutrophil functions (chemotaxis, adherence, phagocytosis, respiratory burst)	O'Donnell et al;[13] Skoutelis et al;[14] Hulse et al;[15] Heine et al;[16] Nishina et al;[17] Krumholz et al;[18]
	Inhibits monocyte functions (phagocytosis, respiratory burst)	Heller et al;[19] Davidson et al;[20]
	Inhibits lymphocyte proliferation	Devlin et al;[21] Chanimov et al;[22]
	Reduces CD14 + expression	Rossano et al;[23] Larsen et al;[24] Takaono et al;[25]
	Inhibits IL-1ra release; increases IL-10 release	
	Depresses antigen induced IL-2 release	Correa-Sales et al[26]
	Inhibits transcription factors	Ichiyama et al;[27] Loop et al[29]
	Decreases activity of nitric oxidase synthase	Galley et al[31]
Propofol	Impairs neutrophil function	O'Donnell et al;[13] Skoutelis et al;[14] Galley and Webster[41]
	Inhibits monocyte functions (oxidative burst, phagocytosis)	Jensen et al;[33] Murphy et al;[34] Fröhlich et al[35]
	Inhibits protein kinase effects generated by lipid solvent	Mikawa et al[36] Nagata et al[39] Cleary and Pickering;[37] Kelbel et al;[38] Ohmizo et al[40]
	Lymphocyte proliferation not impaired	Pirttikangas et al;[43] Salo et al[45]
	Cytokine release not impaired	Larsen et al;[24] Hoff et al[46]
Sufentanil/ alfentanil	Reduces migration of transendothelial leukocytes	Hofbauer et al[64]
	Inhibits lymphocyte proliferation	Sacerdote et al[65]
Fentanyl	No effect on polymorphonuclear cells	Jaeger et al[62]
	No effects on spontaneous and endotoxin-stimulated cytokine response	Larsen et al[24]
	Enhances natural killer cell cytotoxicity	Yeager et al[60]
	Numbers of T- and B- lymphocytes unchanged	Jacobs et al[61]
Volatile anaesthetics	Dose and time-dependent	
	Inhibitory effects on neutrophil functions	Welch;[66] Nakagawara et al;[67] Fröhlich et al[68]
	Depresses lymphocyte proliferation	Ferrero et al;[69] Hamra and Yaksh[70]
	Suppressive effects on cytokine release	Stevenson et al;[71] Mitsuhata et al[72]
	Depresses cytokine in alveolar cells	Giraud et al[73]
	Increases pro-inflammatory cytokines	Kotani et al[74]

IL, interleukin.

Schneemilch CE. Best Practice & Research Clinical Anaesthesiology 2004, 18(3):493–507

British Journal of Anaesthesia, 130 (5): 536–545 (2023)

Five commercial 'depth of anaesthesia' monitors provide discordant clinical recommendations in response to identical emergence-like EEG signals

Darren Hight[1,*], Matthias Kreuzer[2], Gesar Ugen[1], Peter Schuller[3], Frank Stüber[1], Jamie Sleigh[4] and Heiko A. Kaiser[1,5]

[1]Department of Anaesthesiology and Pain Medicine, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland, [2]Department of Anesthesiology and Intensive Care Medicine, Technical University of Munich, School of Medicine, Munich, Germany, [3]Department of Anaesthesia, Cairns Hospital, Cairns, QLD, Australia, [4]Department of Anaesthesia, Waikato Clinical School, University of Auckland, Hamilton, New Zealand and [5]Centre for Anaesthesiology and Intensive Care Medicine, Hirslanden Klinik Aarau, Hirslanden Group, Aarau, Switzerland

Abstract

Background: 'Depth of anaesthesia' monitors claim to measure hypnotic depth during general anaesthesia from the EEG, and clinicians could reasonably expect agreement between monitors if presented with the same EEG signal. We took 52 EEG signals showing intraoperative patterns of diminished anaesthesia, similar to those that occur during emergence (after surgery) and subjected them to analysis by five commercially available monitors.

Methods: We compared five monitors (BIS, Entropy-SE, Narcotrend, qCON, and Sedline) to see if index values remained within, or moved out of, each monitors' recommended index range for general anaesthesia for at least 2 min during a period of supposed lighter anaesthesia, as observed by changes in the EEG spectrogram obtained in a previous study.

Results: Of the 52 cases, 27 (52%) had at least one monitor warning of potentially inadequate hypnosis (index above range) and 16 of the 52 cases (31%) had at least one monitor signifying excessive hypnotic depth (index below clinical range). Of the 52 cases, only 16 (31%) showed concordance between all five monitors. Nineteen cases (36%) had one monitor discordant compared with the remaining four, and 17 cases (33%) had two monitors in disagreement with the remaining three.

Conclusions: Many clinical providers still rely on index values and manufacturer's recommended
decision making. That two-thirds of cases showed discordant recommendations given identic
third signified excessive hypnotic depth where the EEG would suggest a lighter hypnotic st
tance of personalised EEG interpretation as an essential clinical skill.

Editor's key points

- In only one third of the 52 cases did all five monitors agree as to whether the patient had a hypnotic state 'too light' or 'too deep', and a third of the cases had one monitor signaling excessive hypnotic depth, when the EEG clearly suggested otherwise.
- Personalised EEG interpretation is an important clinical skill in anaesthesiology.

Rozhodující je osobní zkušenost, interpretace EEG monitorace je důležitou dovedností anesteziolog!

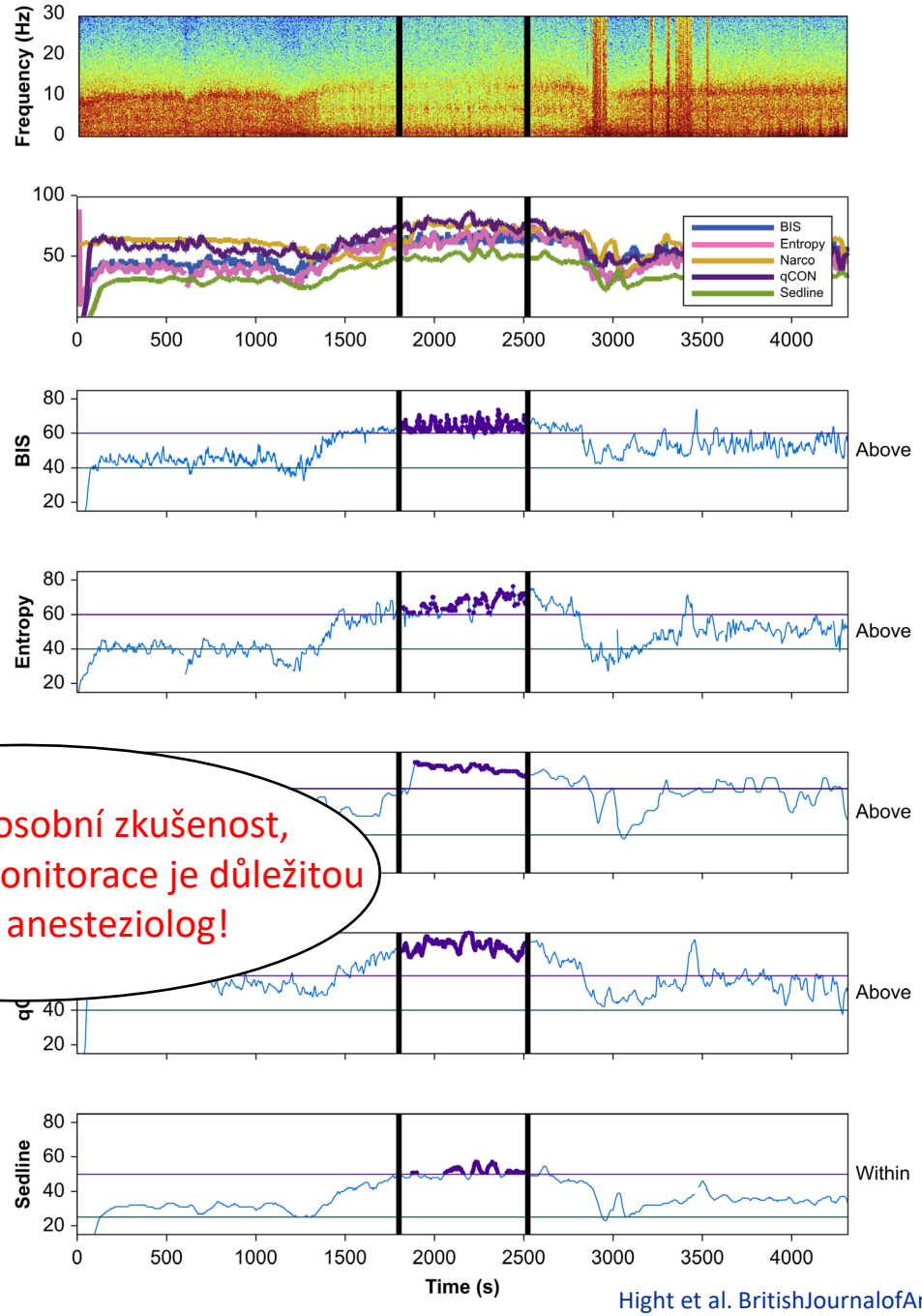
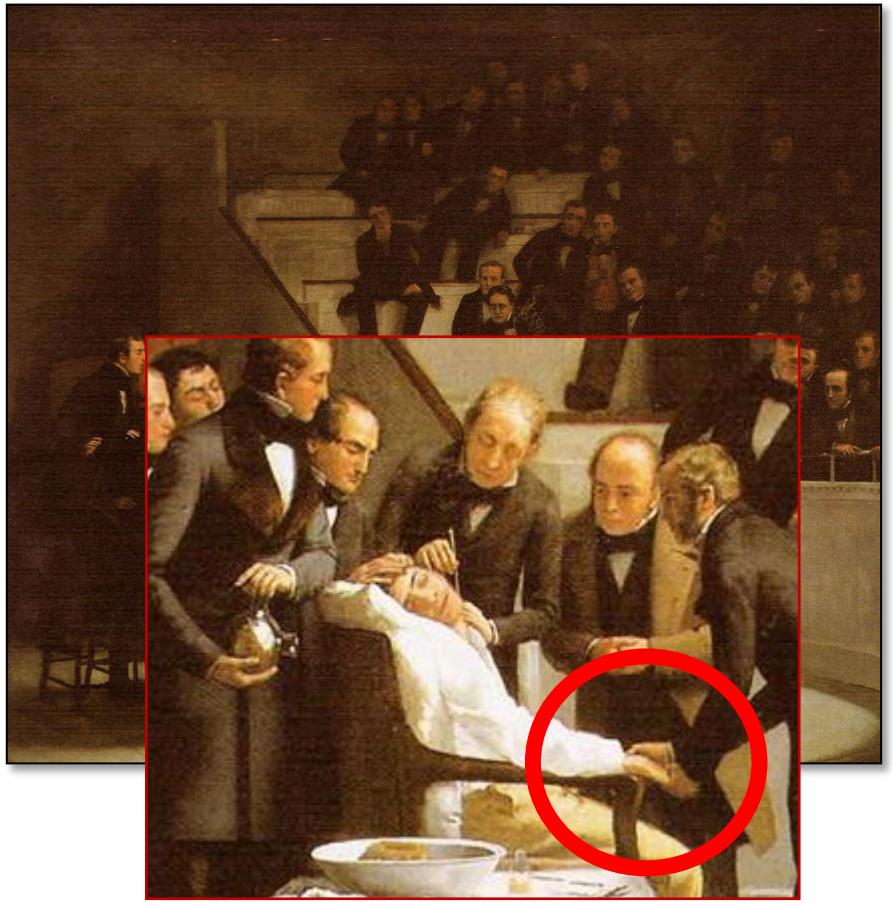


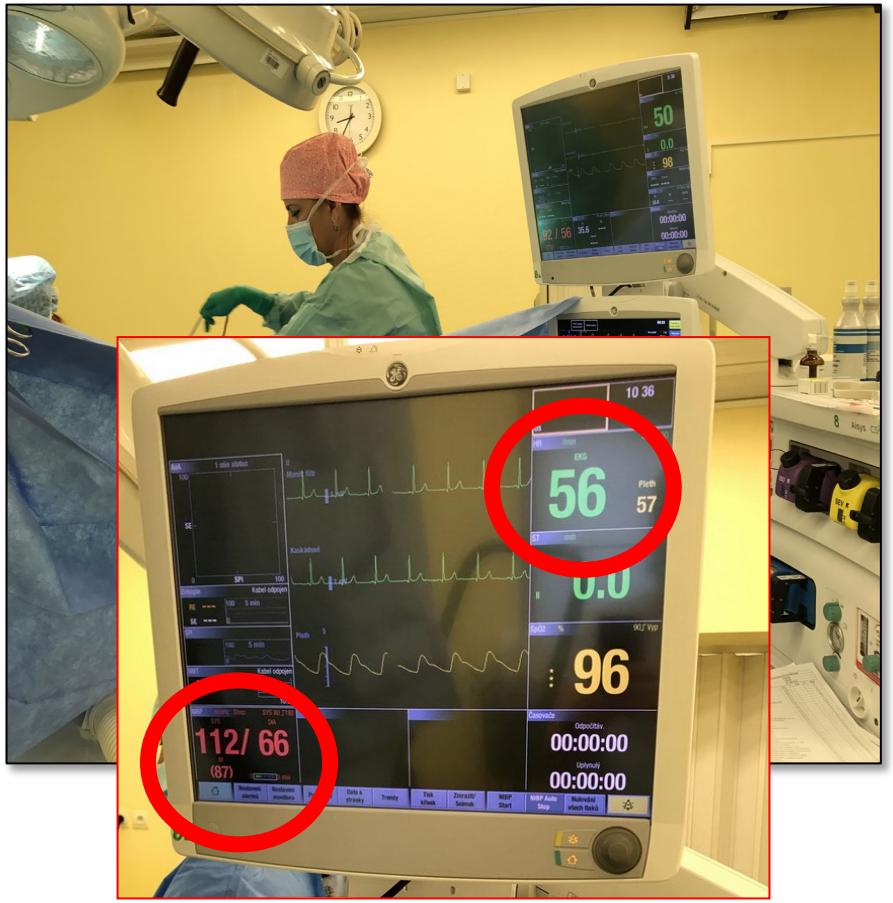
Fig 1. Portrayal of key methods (in a single patient) used to evaluate monitor concordance and discordance. Index values (shown overlapping in the second row, and individually in the third to final rows) from the five monitors were aligned with the EEG (here portrayed in a spectrogram, top row). The onset and offset of the time period of interest is shown with vertical black lines at 1800 and 2500 s. If the maximal or minimal recommended index safety range (shown as purple and green lines respectively) for general anaesthesia for each monitor was exceeded consecutively for at least 2 min during the period of interest, the case was classified as 'above' or 'below' clinical range accordingly. If these ranges were not exceeded, the case was classified as remaining 'within' clinical range.

Hight et al. BritishJournalofAnaesthesia,130(5):536-545(2023)

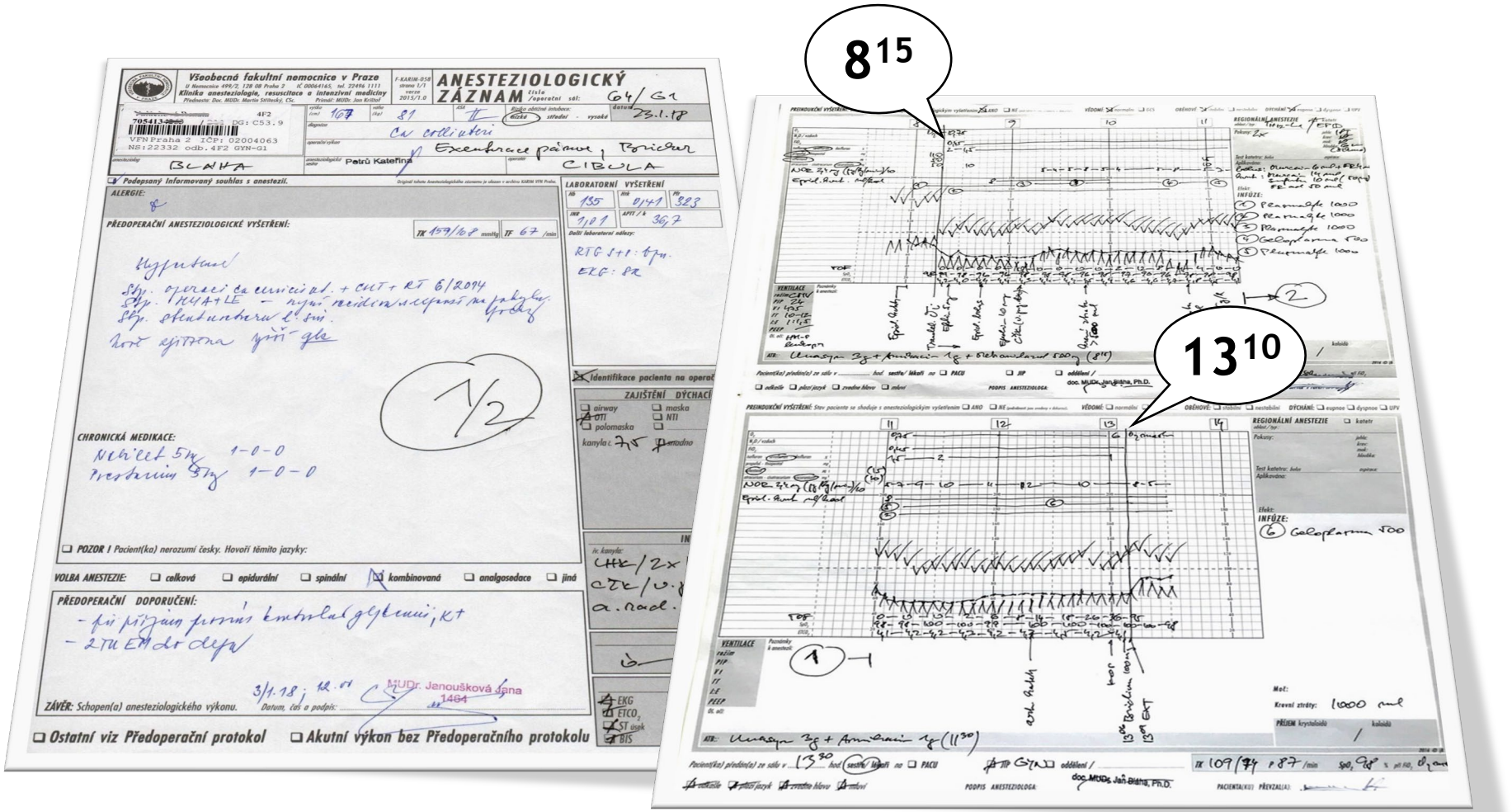
*Boston, říjen **1846***

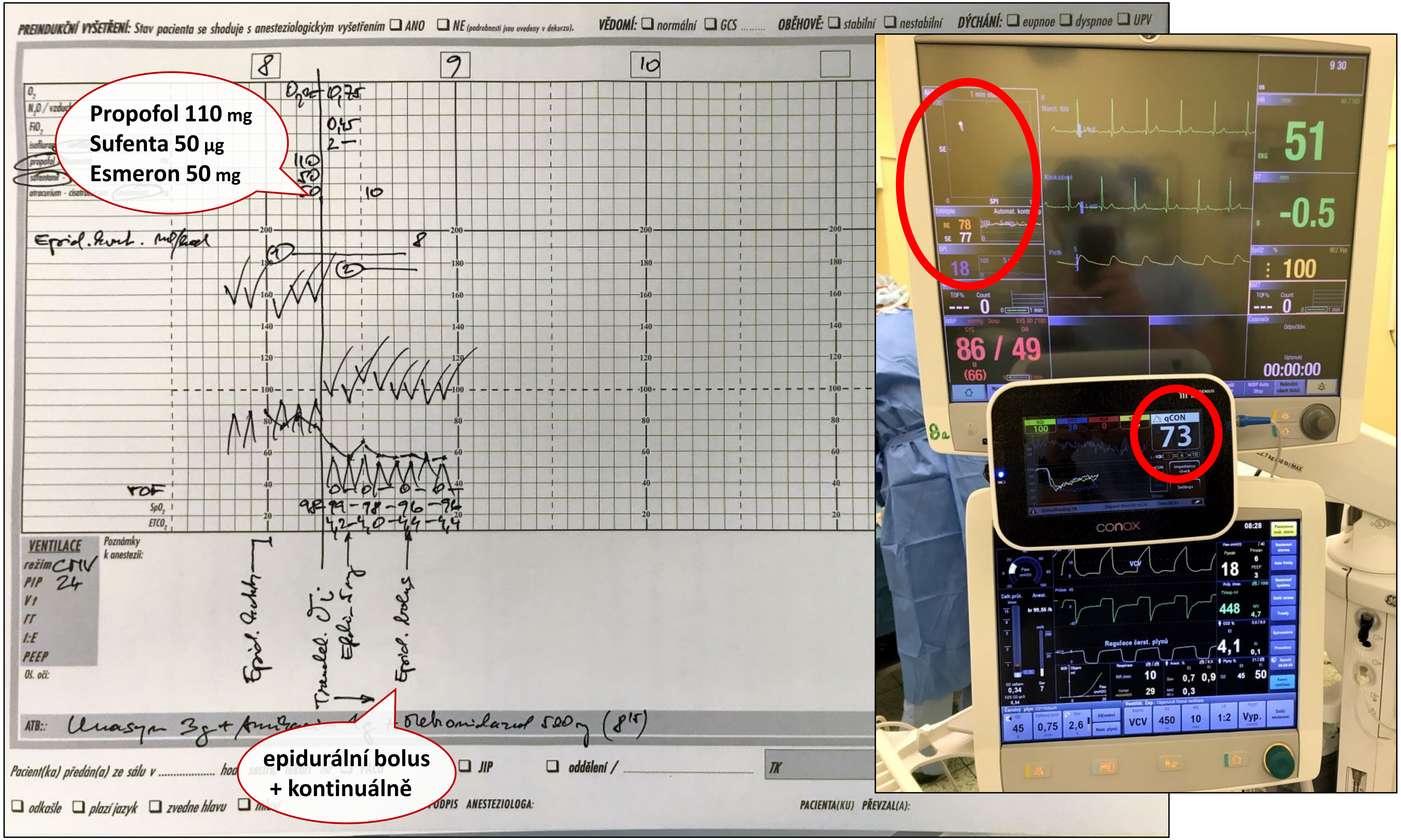


*Praha, říjen **2023***

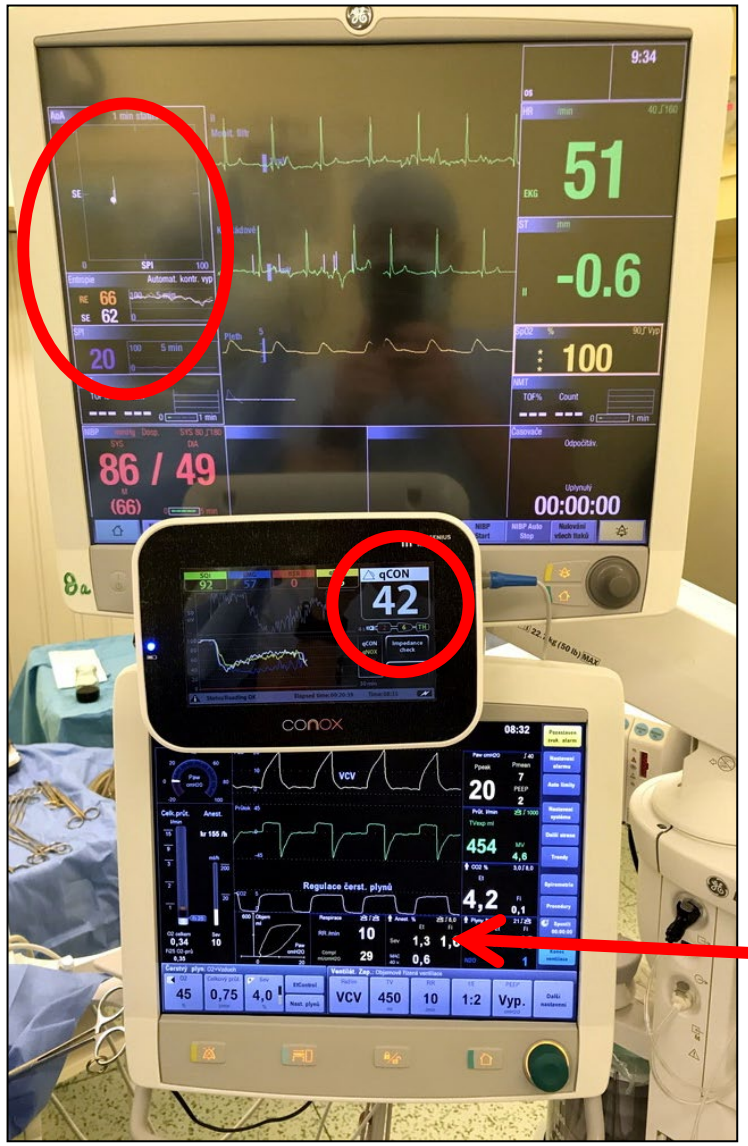


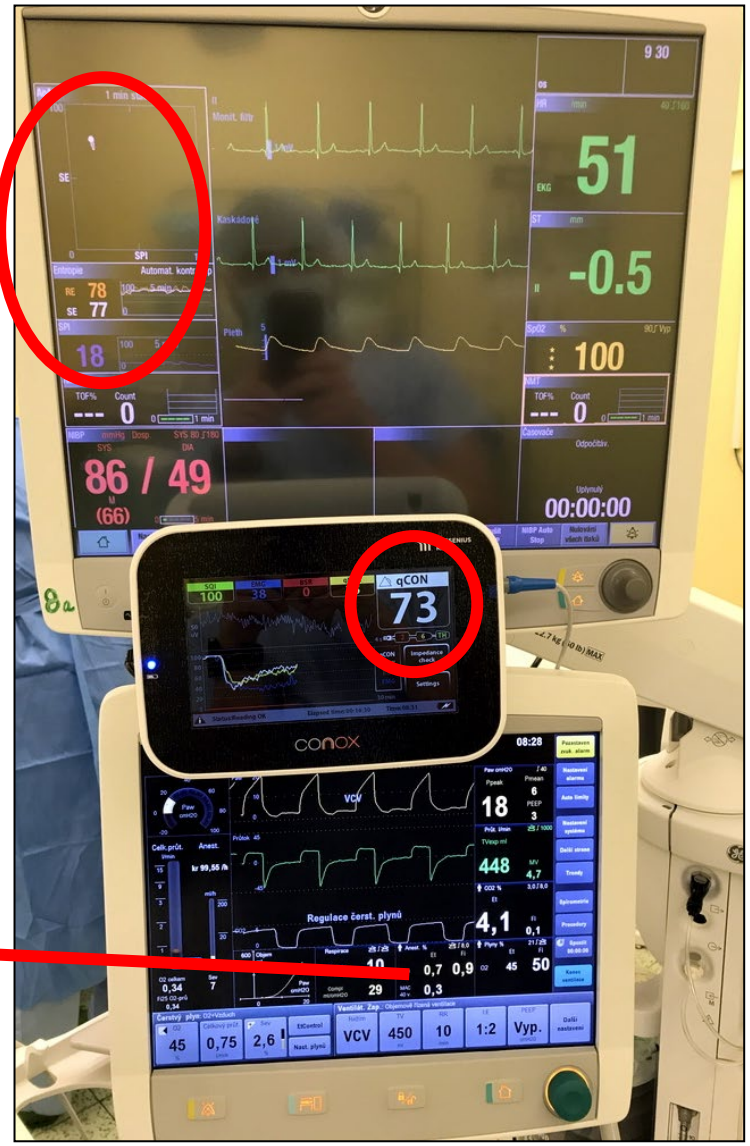
jan.blaha@vfn.cz

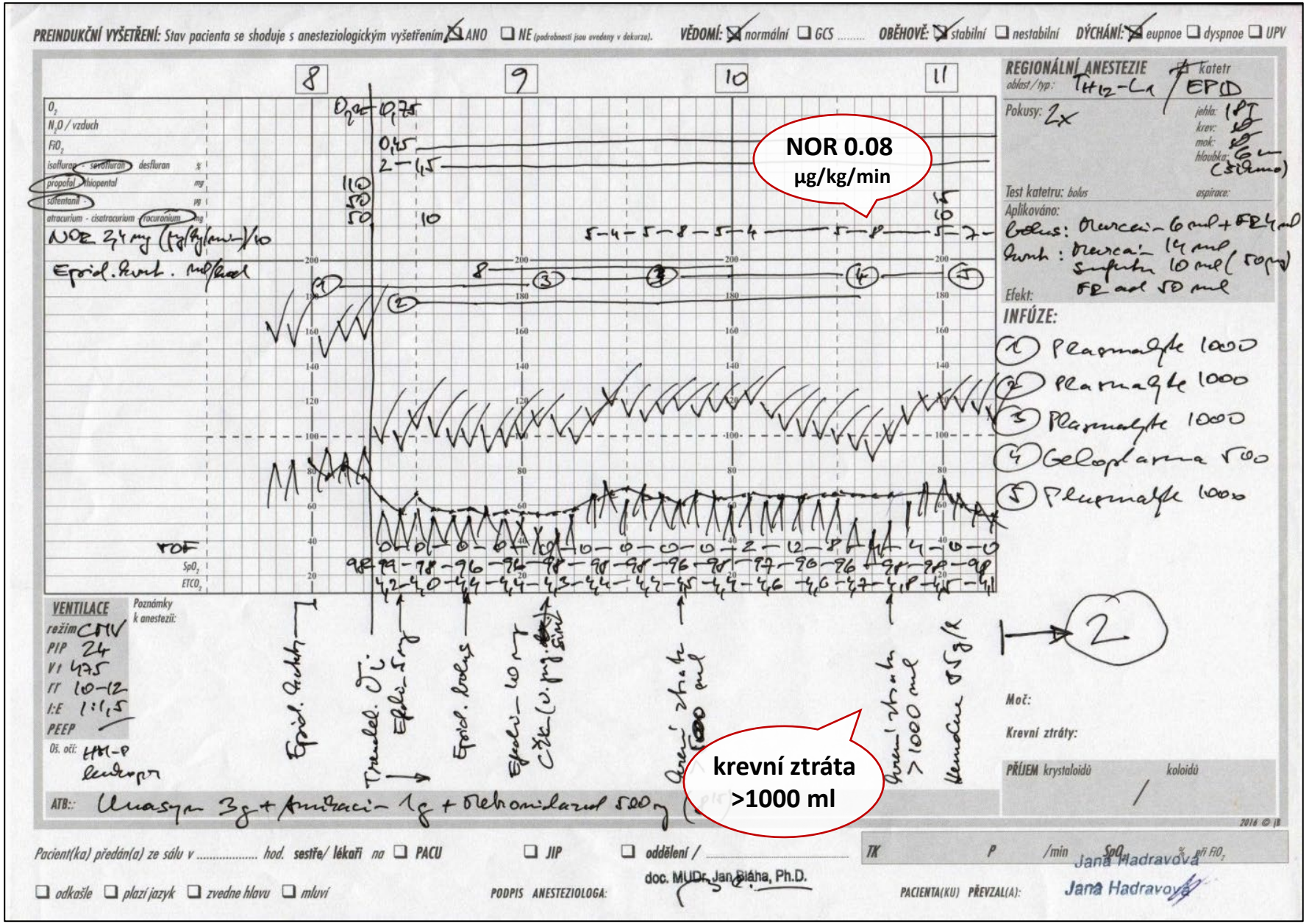

8 15
13 10
Všeobecná fakultní nemocnice v Praze
Klinika anestezie, resuscitace a intenzivní medicíny
ANESTEZIOLOGICKÝ ZÁZNAM
Petrů Kateřina
BLAHA
CIBULA
ALERGIE:
PŘEDOPERAČNÍ ANESTEZIOLOGICKÉ VYŠETŘENÍ:
CHRONICKÁ MEDIKACE:
Nebilet 5mg 1-0-0
Prestarium 5mg 1-0-0
LABORATORNÍ VYŠETŘENÍ
ZAJIŠTĚNÍ DÝCHACÍCH CEST
VOLBA ANESTEZIE: celková epidurální spinální kombinovaná analgosedace jiná
PŘEDOPERAČNÍ DOPORUČENÍ:
ZÁVĚR: Schopen(a) anesteziologického výkonu.
Ostatní viz Předoperační protokol
Akutní výkon bez Předoperačního protokolu
REGIONÁLNÍ ANESTEZIE
INFÚZE:
Plasmafl 1000
Gelofusal 500
Krevní ztráty: 1000 ml
MUDr. Janoušková Jana
1464
doc. MUDr. Jan Blaha, Ph.D.

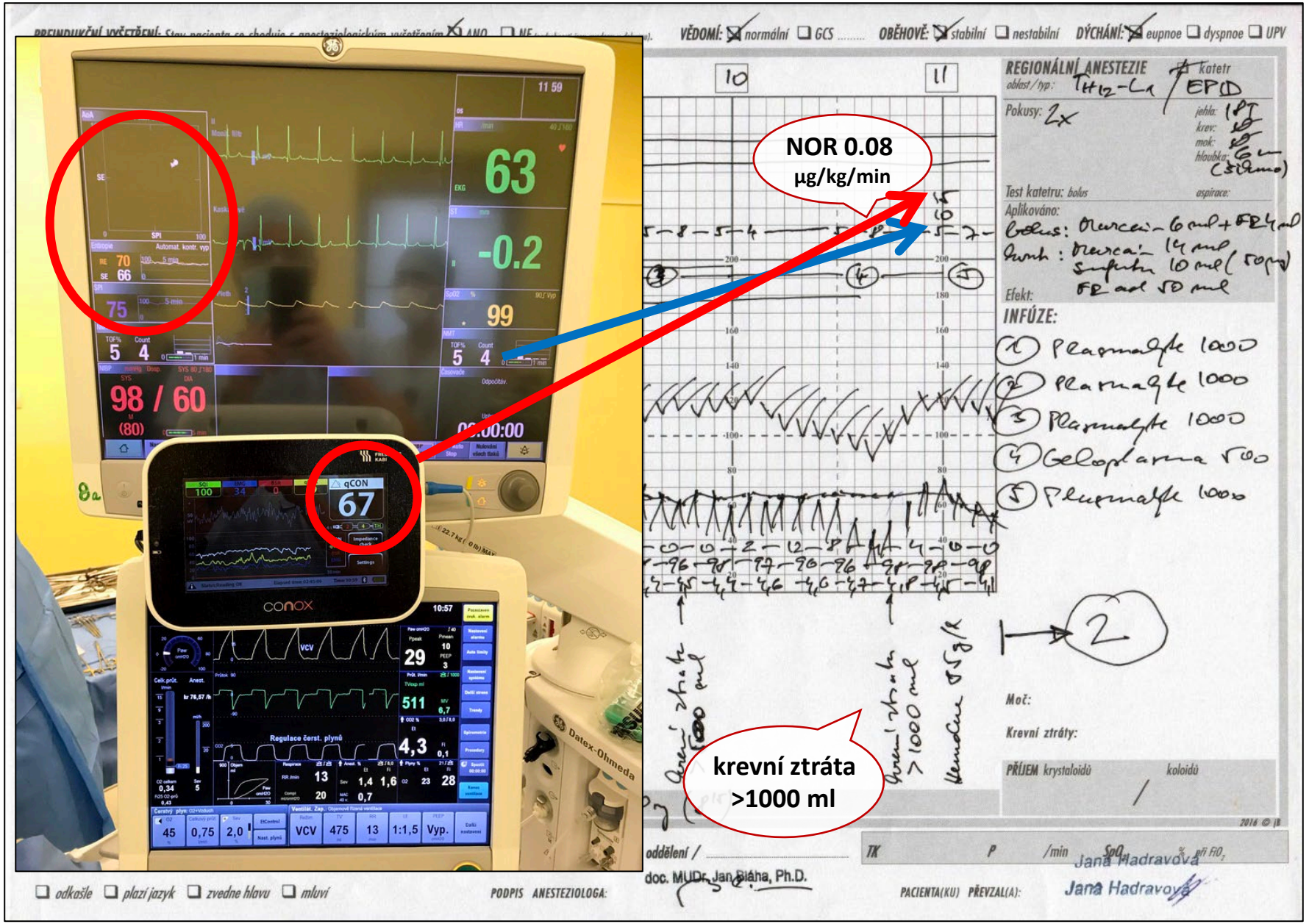

PREINDUKČNÍ VYŠETŘENÍ: Stav pacienta se shoduje s anesteziologickým vyšetřením ANO NE (podrobnosti jsou uvedeny v dekurzu).
VĚDOMÍ: normální GCS
OBĚHOVĚ: stabilní nestabilní
DÝCHÁNÍ: eupnoe dyspnoe UPV
Propofol 110 mg
Sufenta 50 μg
Esmeron 50 mg
VENTILACE
režim
PIP
Poznámky k anestezii:
ATB:
epidurální bolus
+ kontinuálně
Pacient(ka) předán(a) ze sálu v
JIP
oddělení /
odkašle
plazí jazyk
zvedne hlavu
PODPIS ANESTEZIOLOGA:
PACIENTA(KU) PŘEVZAL(A):
86 / 49
(66)
51
-0.5
100
qCON
73
conox
VCV
450
10
1:2


9:50
67
0.0
95
111/ 69
(85)
00:00:00
qCON
37
conox
08:49
24
463
4,5
Regulace čerst. plynů

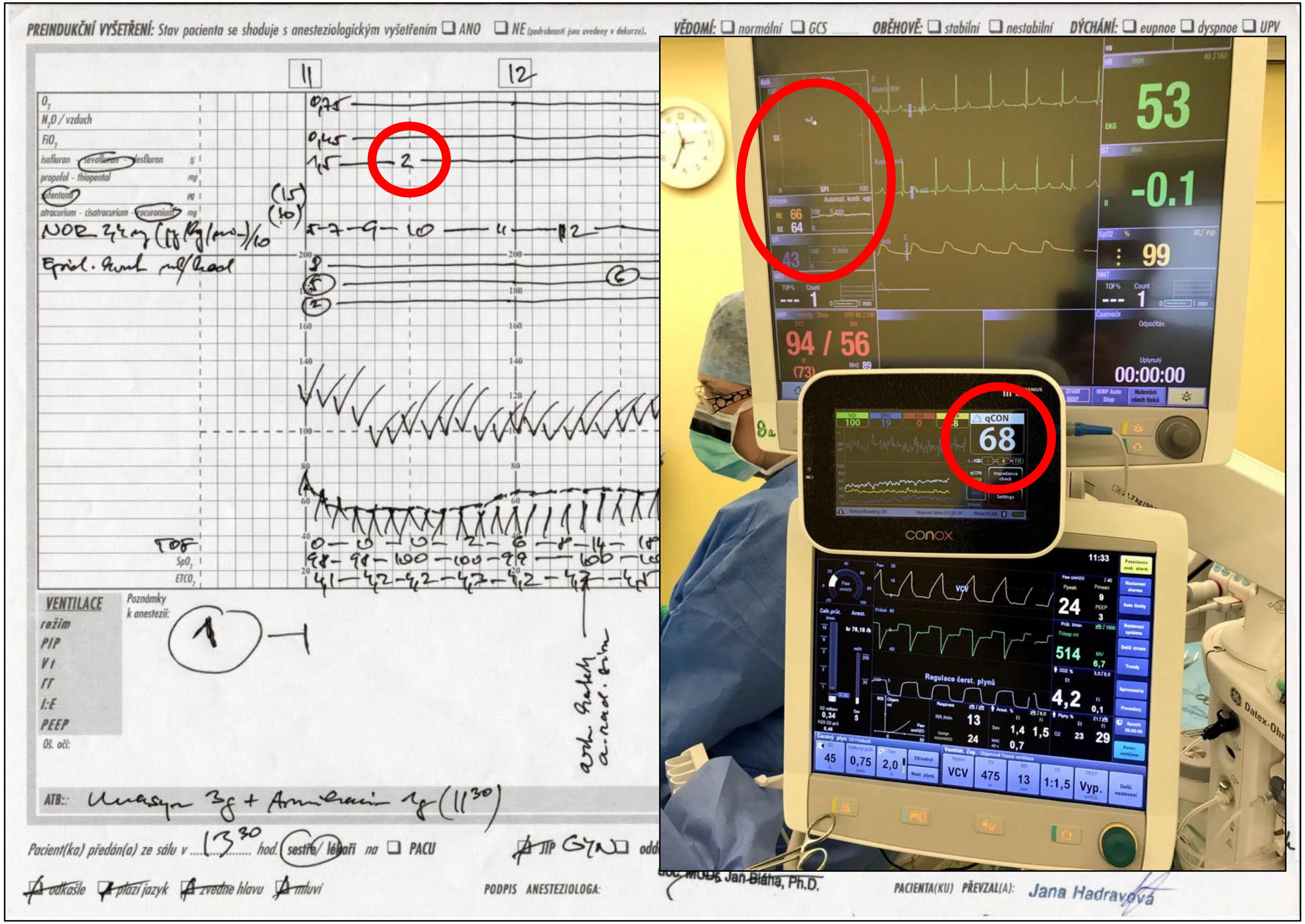

9:34
51
-0.6
100
86 / 49
(66)
00:00:00
qCON
42
conox
08:32
20
454
4,2
Regulace čerst. plynů


9 30
51
-0.5
100
86 / 49
(66)
00:00:00
qCON
73
conox
08:28
18
448
4,1
Regulace čerst. plynů


PREINDUKČNÍ VYŠETŘENÍ: Stav pacienta se shoduje s anesteziologickým vyšetřením ☒ ANO ☐ NE (podrobnosti jsou uvedeny v dekurzu).
VĚDOMÍ: ☒ normální ☐ GCS ..... OBĚHOVĚ: ☒ stabilní ☐ nestabilní DÝCHÁNÍ: ☒ eupnoe ☐ dyspnoe ☐ UPV
8
9
10
11
NOR 0.08
µg/kg/min
REGIONÁLNÍ ANESTEZIE
Katetr
oblast/typ: Th12-L1 / EPID
Pokusy: 2x
jehla:
krev:
mok:
hloubka:
Test katetru: bolus
aspirace:
Aplikováno:
Efekt:
INFÚZE:
1 Plasmalyte 1000
2 Plasmalyte 1000
3 Plasmalyte 1000
4 Gelofusine 500
5 Plasmalyte 1000
VENTILACE
režim CMV
PIP 24
Vt 475
rr 10-12
I:E 1:1,5
PEEP
Poznámky k anestezii:
Moč:
Krevní ztráty:
PŘÍJEM krystaloidů
koloidů
krevní ztráta >1000 ml
ATB::
Pacient(ka) předán(a) ze sálu v ..... hod. sestře/ lékaři na ☐ PACU ☐ JIP ☐ oddělení / .....
TK P /min SpO2 % při FiO2
☐ odkašle ☐ plazí jazyk ☐ zvedne hlavu ☐ mluví
PODPIS ANESTEZIOLOGA:
doc. MUDr. Jan Bláha, Ph.D.
PACIENTA(KU) PŘEVZAL(A):
Jana Hadravová

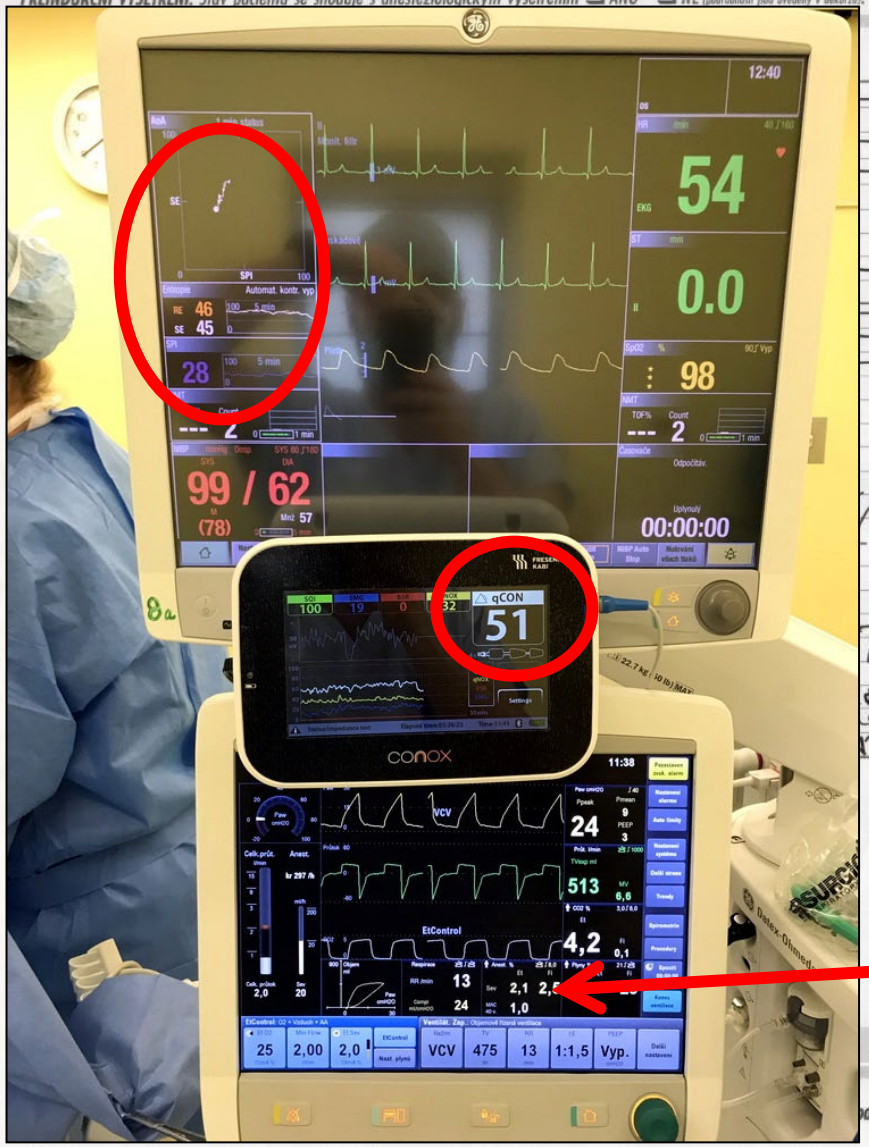

NOR 0.08
µg/kg/min
krevní ztráta
>1000 ml
REGIONÁLNÍ ANESTEZIE
INFÚZE:
Efekt:
Moč:
Krevní ztráty:
PŘÍJEM krystaloidů
koloidů
doc. MUDr. Jan Bláha, Ph.D.
Jana Hadravová
PODPIS ANESTEZIOLOGA:
PACIENTA(KU) PŘEVZAL(A):
conox
qCON
67
63
-0.2
99
98 / 60
29
511
4,3
Regulace čerst. plynů
Datex-Ohmeda

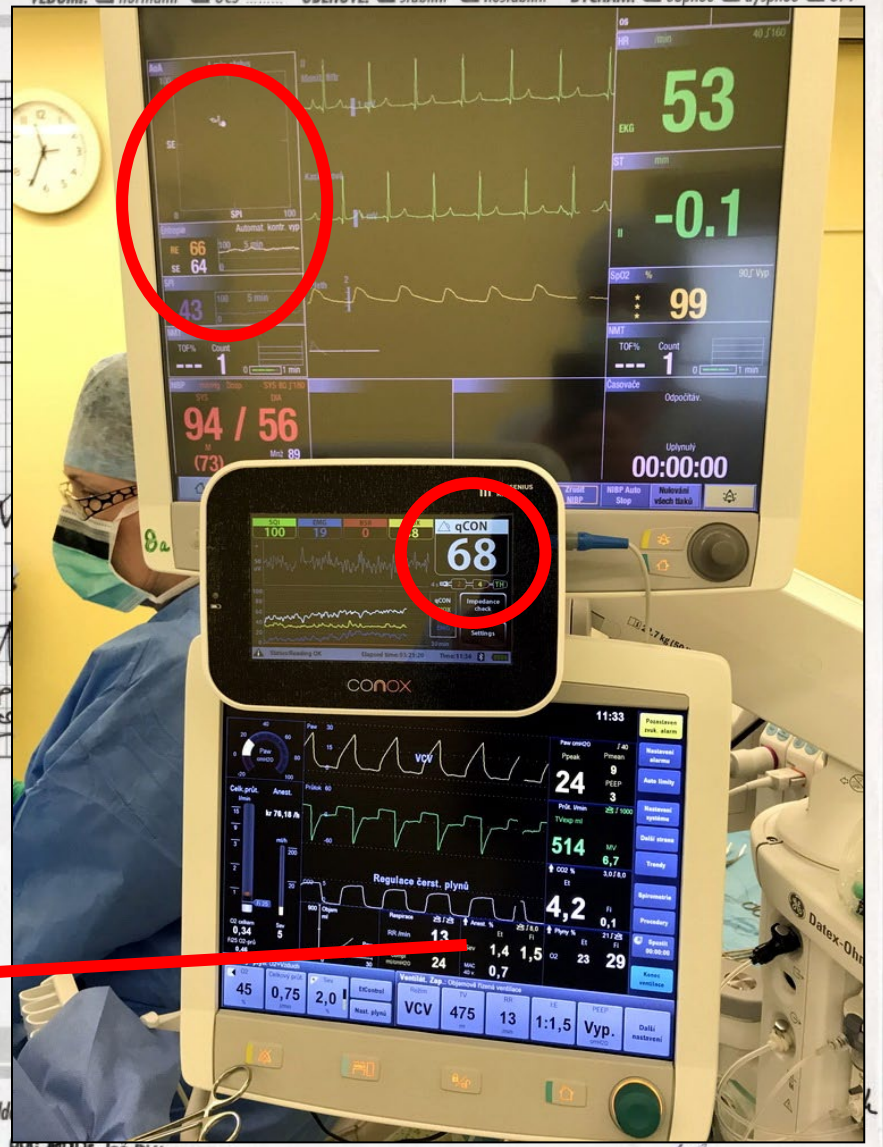

63
0.2
99
98 / 60
(80)
00:00:00
qCON
67
conox
10:57
VCV
29
511
4,3
Regulace čerst. plynů
45
0,75
2,0
VCV
475
13
1:1,5
Vyp.
62
-0.3
99
89 / 56
(72)
00:00:00
qCON
50
conox
11:00
27
511
4,2
Regulace čerst. plynů
45
0,75
2,0
VCV
475
13
1:1,5
Vyp.
Datex-Ohmeda
odkošle
plazí jazyk
zvedne hlavu
mluví
PODPIS ANESTEZIOLOGA:
doc. MUDr. Jan Kliana, Ph.D.
PACIENTA(KU) PŘEVZAL(A):
Jana Hadravová


PREINDUKČNÍ VYŠETŘENÍ: Stav pacienta se shoduje s anesteziologickým vyšetřením ANO NE (podrobnosti jsou uvedeny v dekurzu).
VĚDOMÍ: normální GCS
OBĚHOVĚ: stabilní nestabilní
DÝCHÁNÍ: eupnoe dyspnoe UPV
O2
N2O / vzduch
FiO2
isofluran sevofluran desfluran
propofol - thiopental
sufentanil
atracurium - cisatracurium rocuronium
NOR
TOF
SpO2
ETCO2
VENTILACE
režim
PIP
Vt
f
I:E
PEEP
Oš. oči:
Poznámky k anestezii:
ATB:
Pacient(ka) předán(a) ze sálu v 13³⁰ hod. sestře/ lékaři na PACU JIP
odkašle
plazí jazyk
zvedne hlavu
mluví
PODPIS ANESTEZIOLOGA:
doc. MUDr. Jan Bláha, Ph.D.
PACIENTA(KU) PŘEVZAL(A):
Jana Hadravová
53
-0.1
99
94 / 56
(73)
00:00:00
qCON
68
conox
VCV
24
514
4,2
45
0,75
2,0
475
13
1:1,5
Vyp.
Regulace čerst. plynů
Datex-Ohmeda

PREINDUKČNÍ VYŠETŘENÍ: Stav pacienta se shoduje s anesteziologickým vyšetřením ☐ ANO ☐ NE (podrobnosti jsou uvedeny v dekurzu).

VĚDOMÍ: ☐ normální ☐ GCS ..... OBĚHOVĚ: ☐ stabilní ☐ nestabilní DÝCHÁNÍ: ☐ eupnoe ☐ dyspnoe ☐ UPV

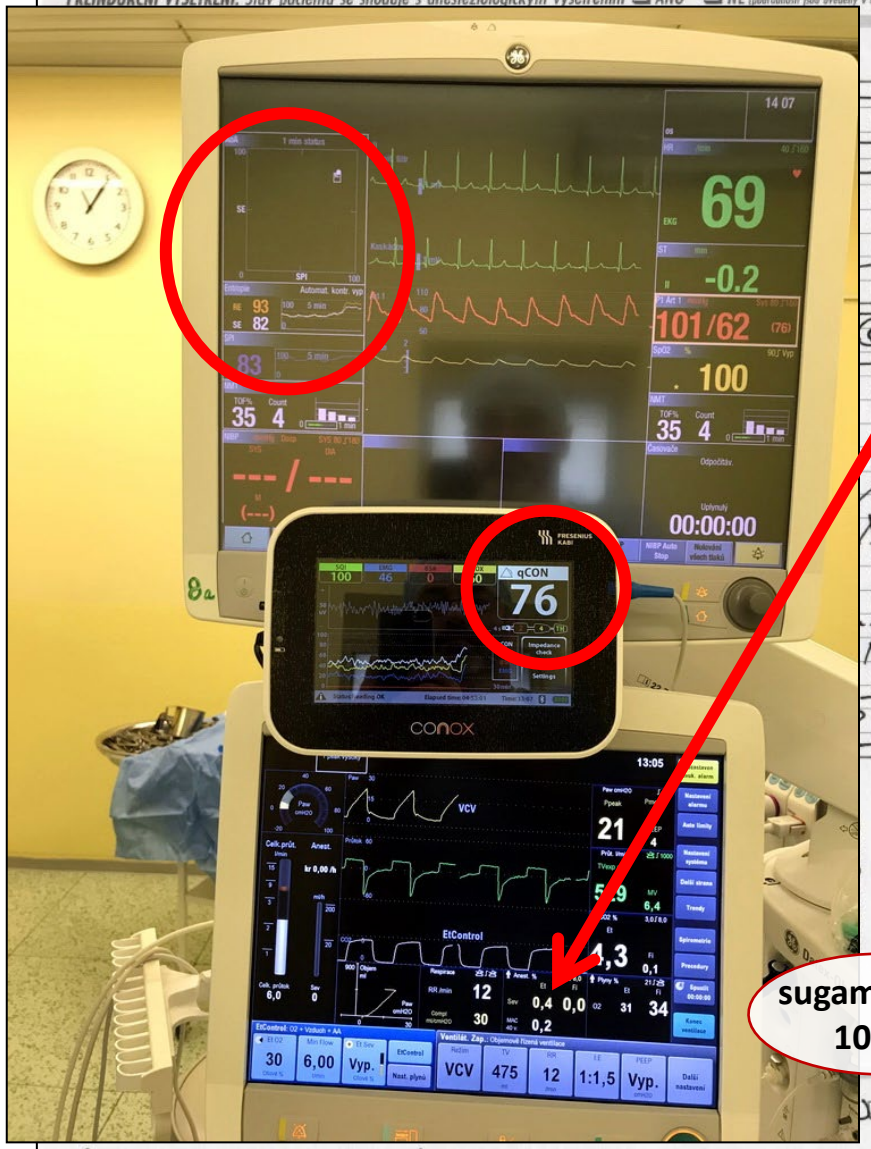




odkašle ☐ plazí jazykem ☐ zvedne hlavu ☐ mluví

PODPIS ANESTEZIOLOGA: doc. MUDr. Jan Bláha, Ph.D.

PACIENTA(KU) PŘEVZAL(A): Jana Hadravová



PREINDUKČNÍ VYŠETŘENÍ: Stav pacienta se shoduje s anestheziologickým vyšetřením ☐ ANO ☐ NE (podrobnosti jsou uvedeny v dekurzu). VĚDOMÍ: ☐ normální ☐ GCS ..... OBĚHOVĚ: ☐ stabilní ☐ nestabilní DÝCHÁNÍ: ☐ eupnoe ☐ dyspnoe ☐ UPV

REGIONÁLNÍ ANESTEZIE ☐ katetr
oblast / typ:

Pokusy: jehla: krev: mok: hloubka:

Test katetru: bolus aspirace:

Aplikováno:

Efekt:

INFÚZE:

6 Gelofusin 500

Moč:

Krevní ztráty: 1000 ml

PŘÍJEM krystaloidů / koloidů

4000 / 1000

sugammadex 100 mg

☐ oddělení / .....

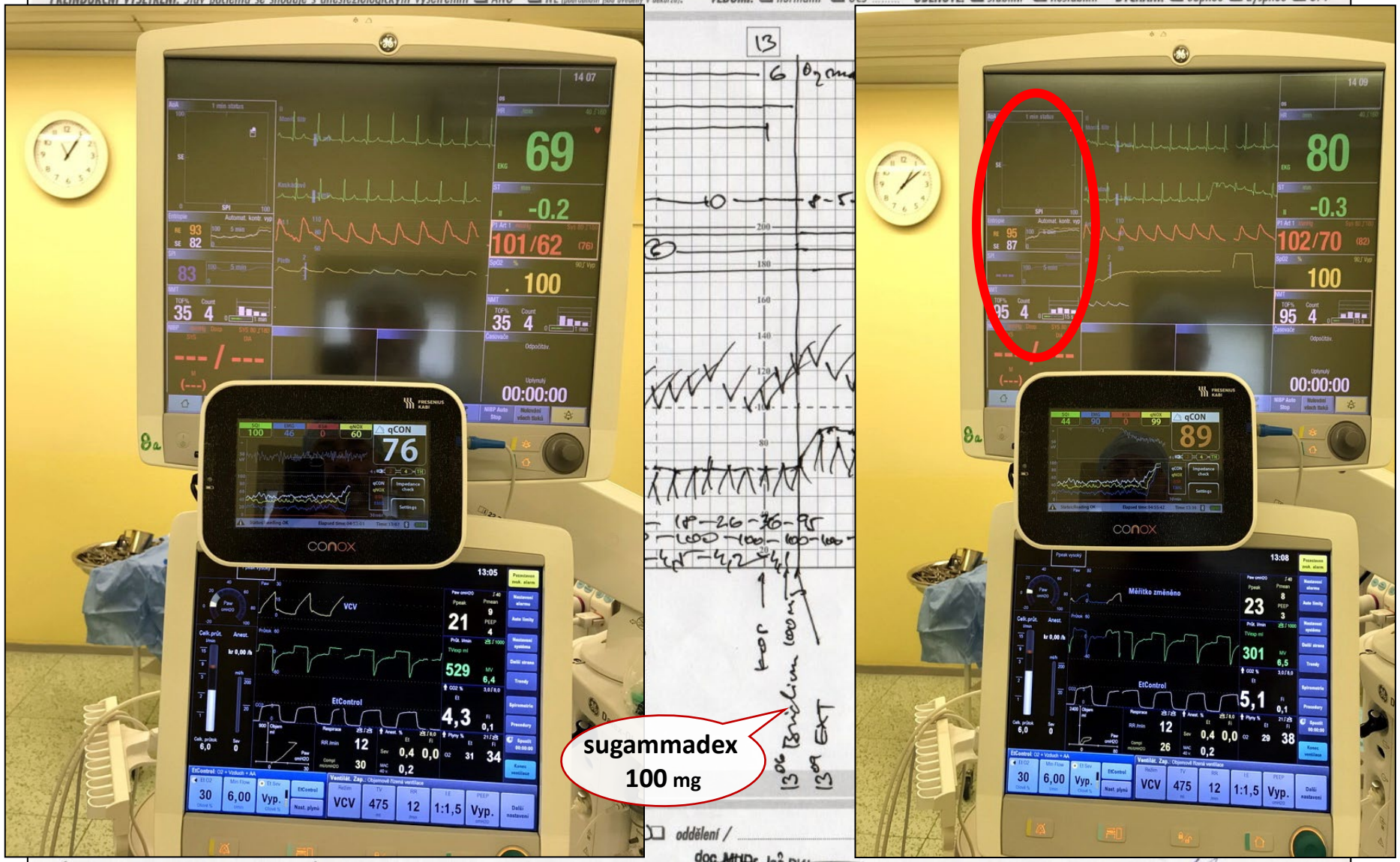
TK 109/74 P 87 /min SpO2 98 % při FiO2 O2 mask

doc. MUDr. Jan Bláha, Ph.D.

PACIENTA(KU) PŘEVZAL(A): Jana Hadravová

odkašle plazí jazyk zvedne hlavu mluví

PODPIS ANESTEZIOLOGA:


PREINDUKČNÍ VYŠETŘENÍ: Stav pacienta se shoduje s anesteziologickým vyšetřením ❑ ANO ❑ NE (podrobnosti jsou uvedeny v dekurzu).
VĚDOMÍ: ❑ normální ❑ GCS .....
OBĚHOVĚ: ❑ stabilní ❑ nestabilní
DÝCHÁNÍ: ❑ eupnoe ❑ dyspnoe ❑ UPV
13
sugammadex
100 mg
oddělení /
doc. MUDr. Jan Bláha, Ph.D.
odkašle
plazí jazyk
zvedne hlavu
mluví
PODPIS ANESTEZIOLOGA:
PACIENTA(KU) PŘEVZAL(A):
Jana Hadravová

XXIX.
kongres České společnosti
anesteziologie, resuscitace
a intenzivní medicíny

5.-7. října 2023
CLARION CONGRESS HOTEL PRAGUE
www.csarim.cz

jan.blaha@vfn.cz