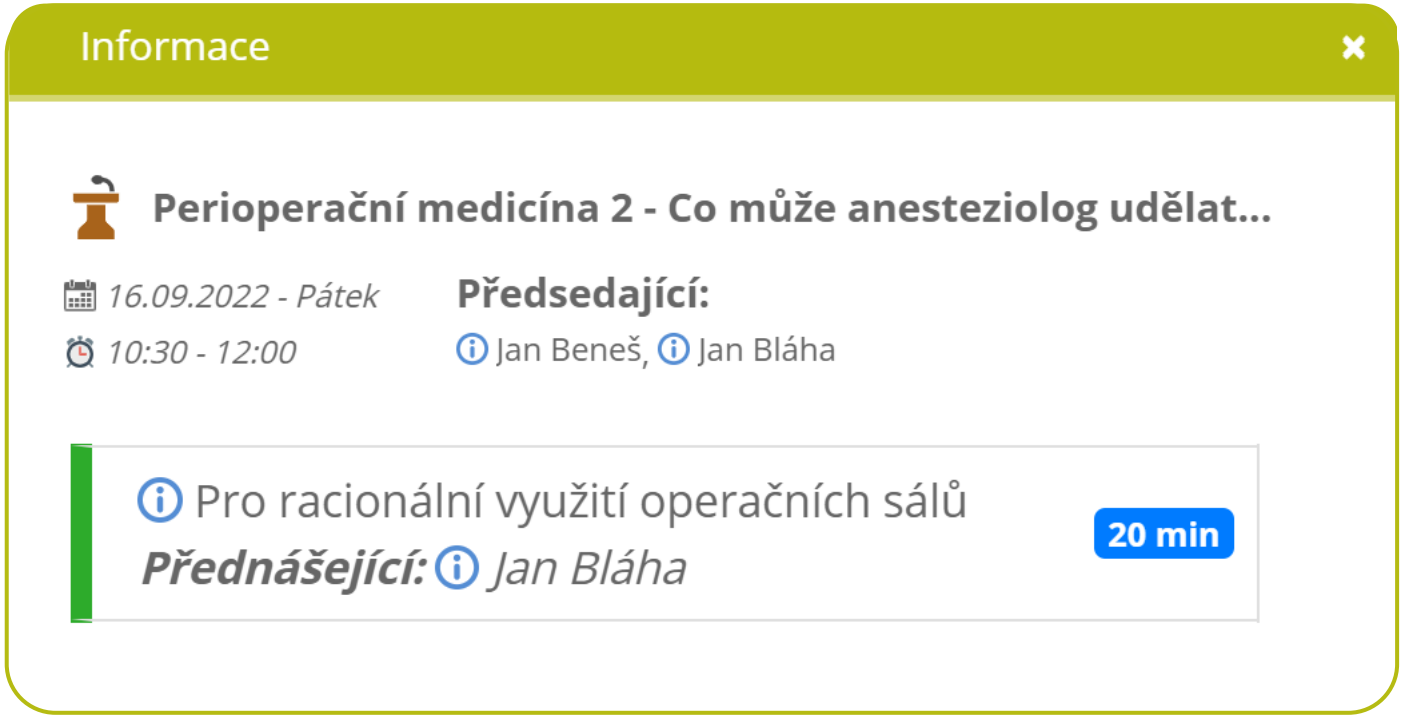

JAN BLÁHA

KLINIKA ANESTEZIOLOGIE, RESUSCITACE A INTENZIVNÍ MEDICÍNY

1. LÉKAŘSKÁ FAKULTA
Univerzita Karlova

VŠEOBECNÁ FAKULTNÍ NEMOCNICE V PRAZE

jan.blaha@vfn.cz

Jak to vidím já po letech praxe…

Pojmem anesteziologové myslím i anesteziložky!

K přednášenému tématu nemám střet zájmů.

JAN BLÁHA

KLINIKA ANESTEZIOLOGIE, RESUSCITACE A INTENZIVNÍ MEDICÍNY

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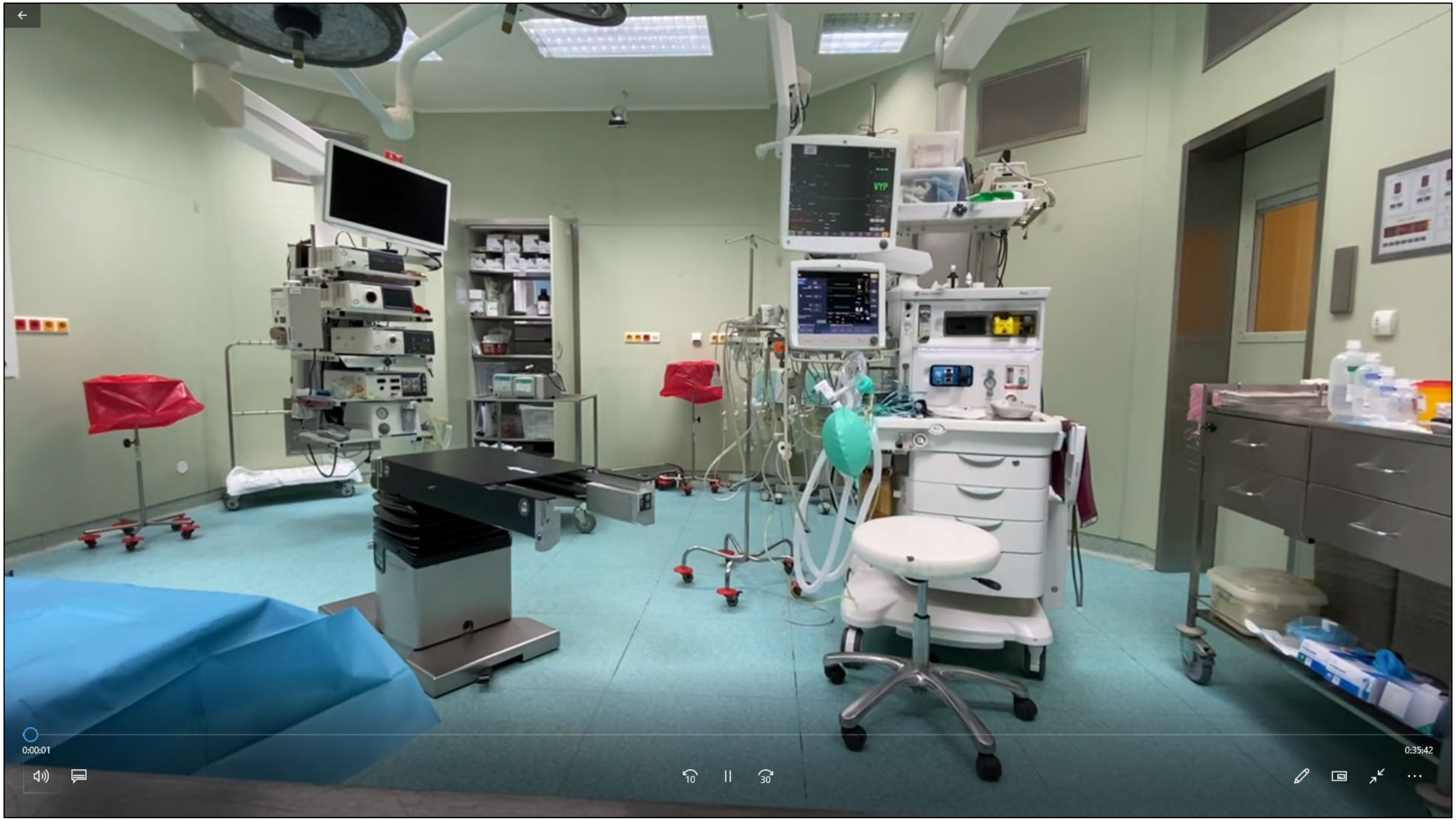
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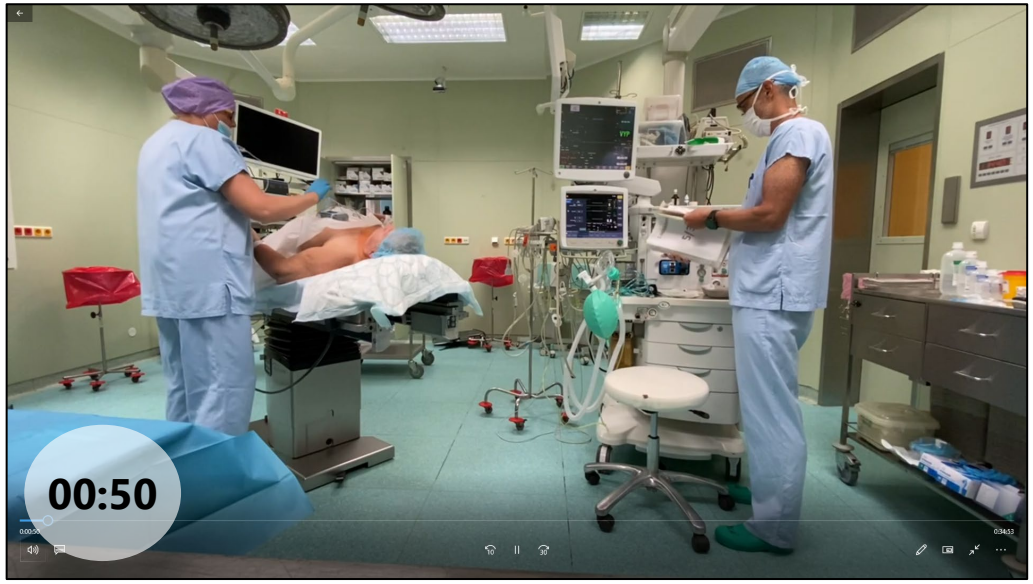
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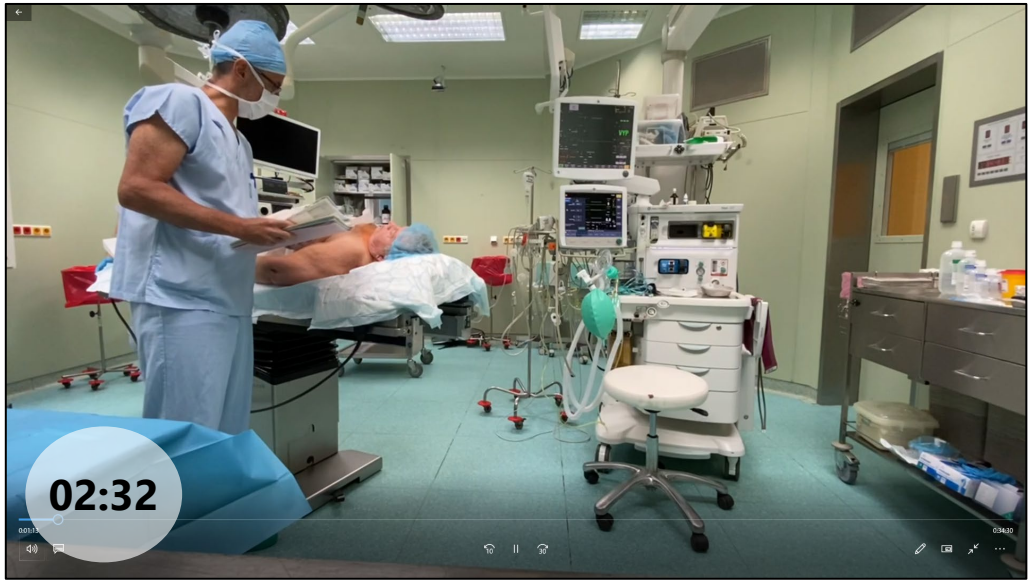
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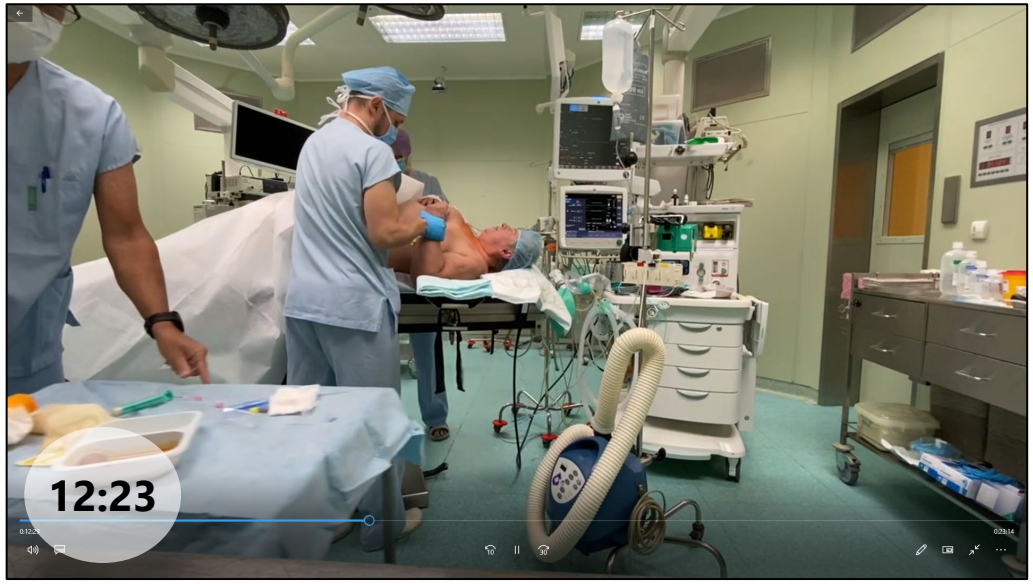
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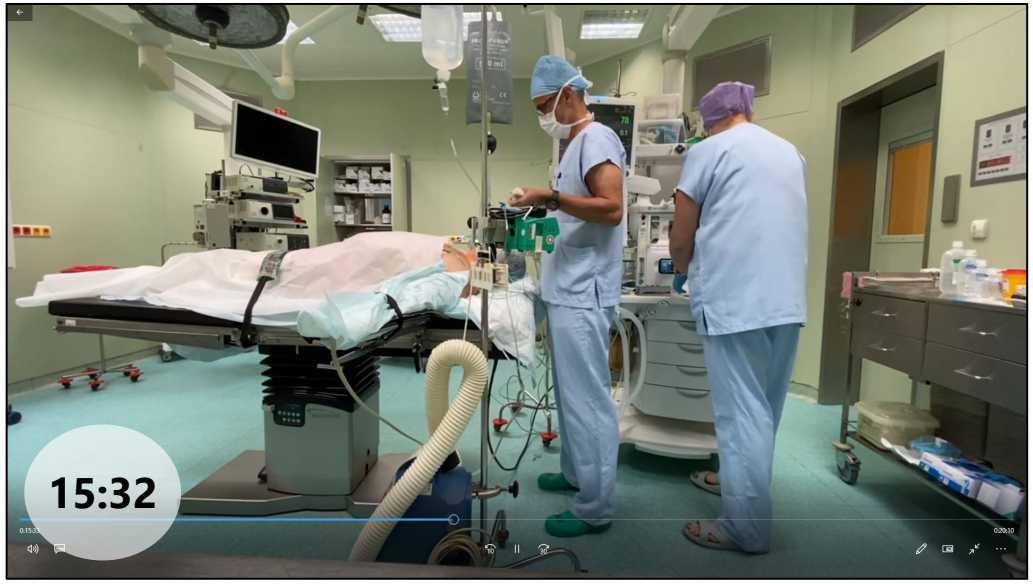
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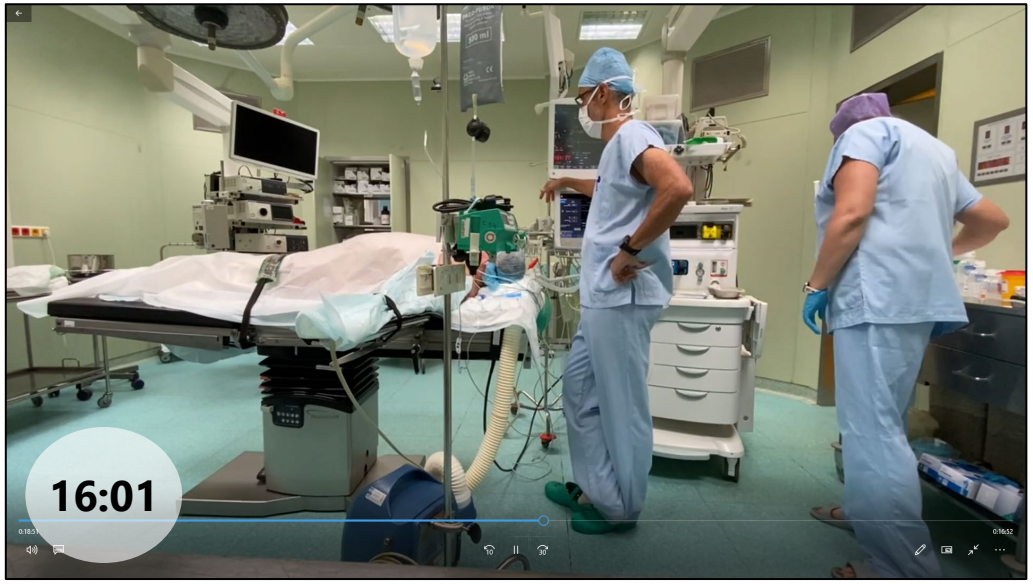
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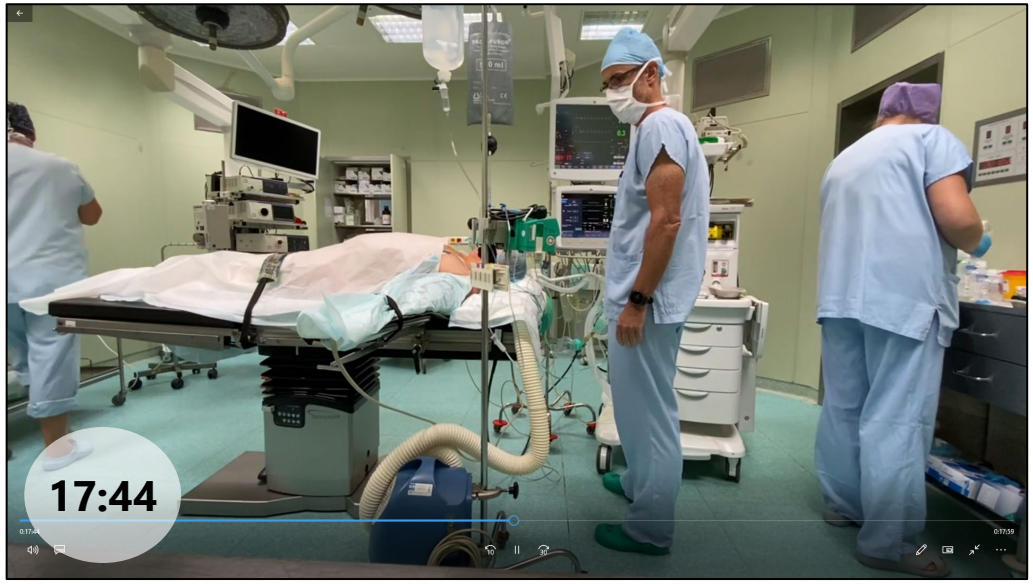
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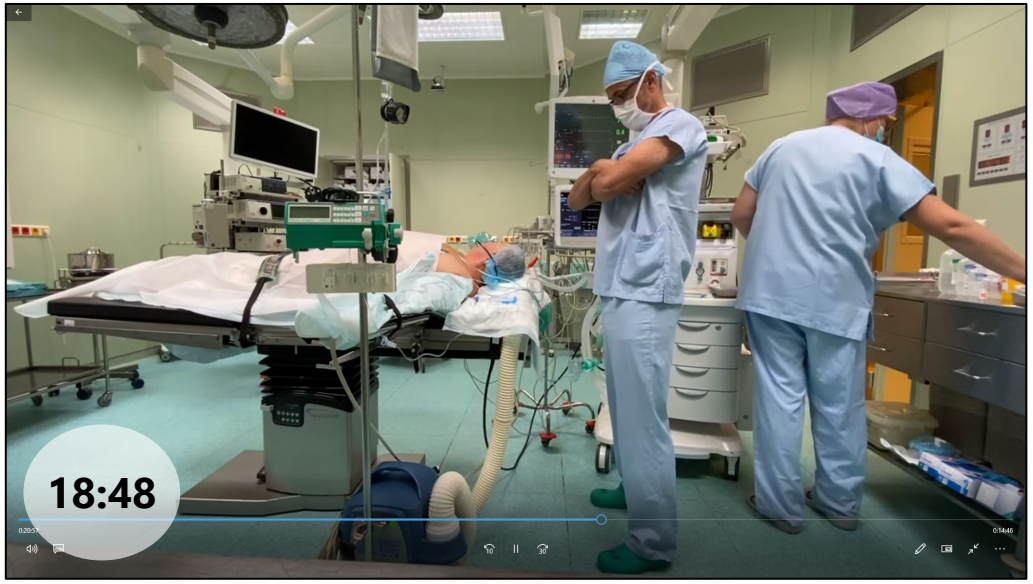
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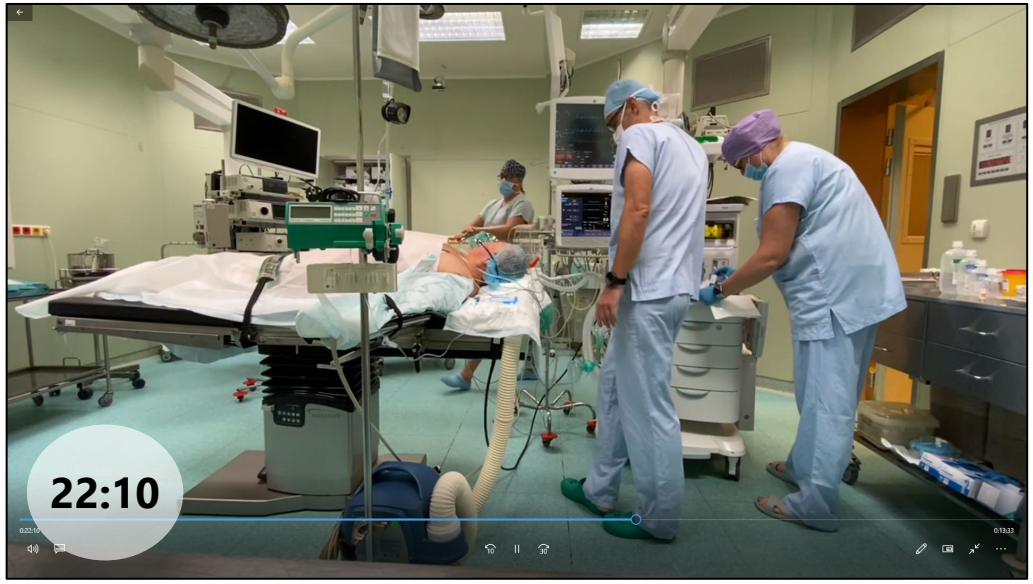
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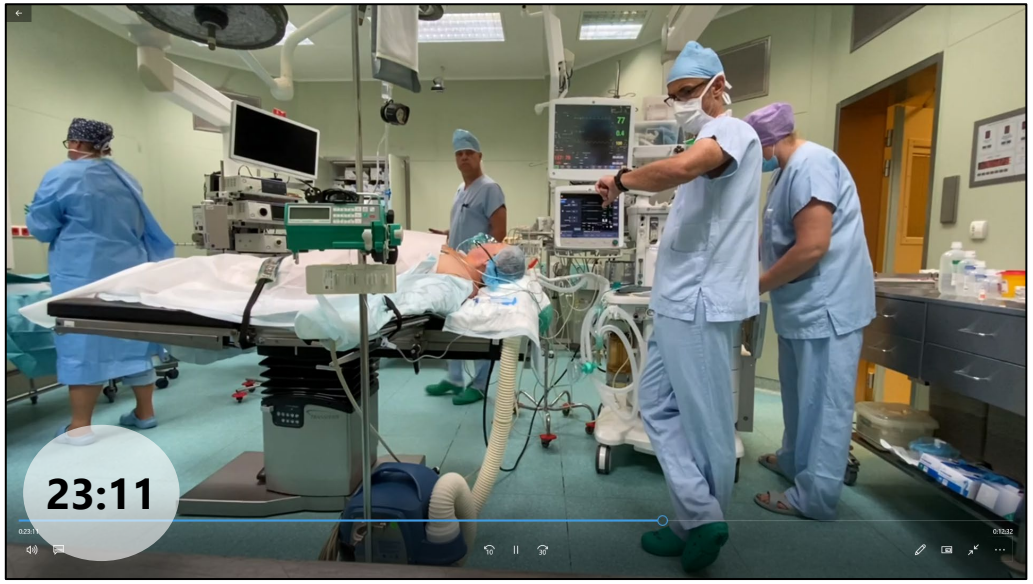
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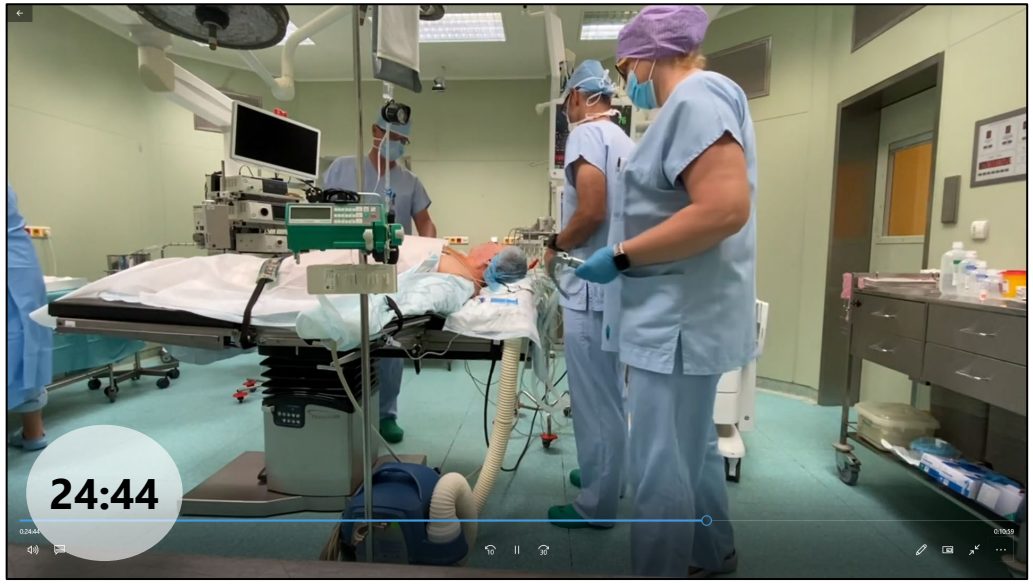
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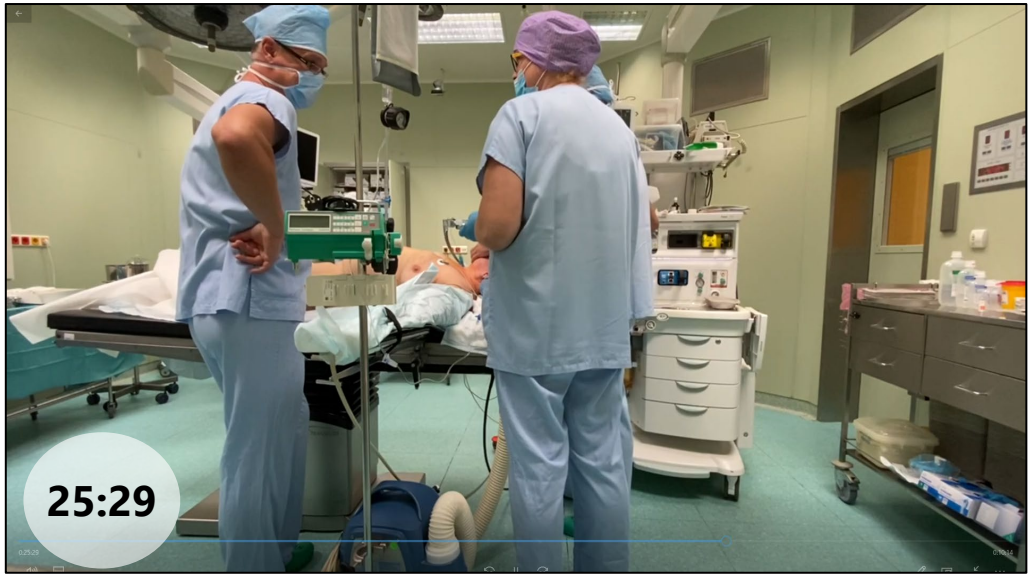
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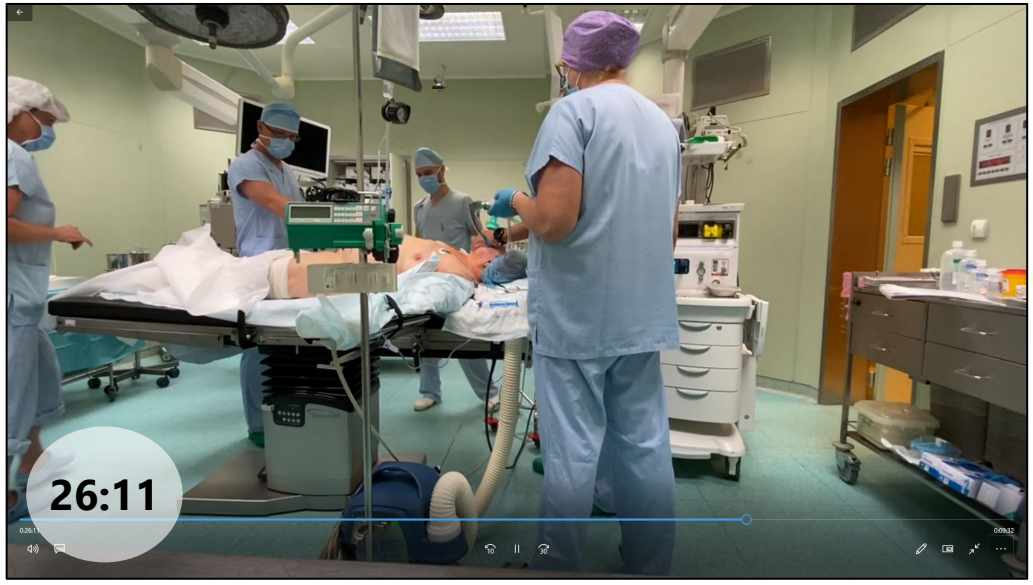
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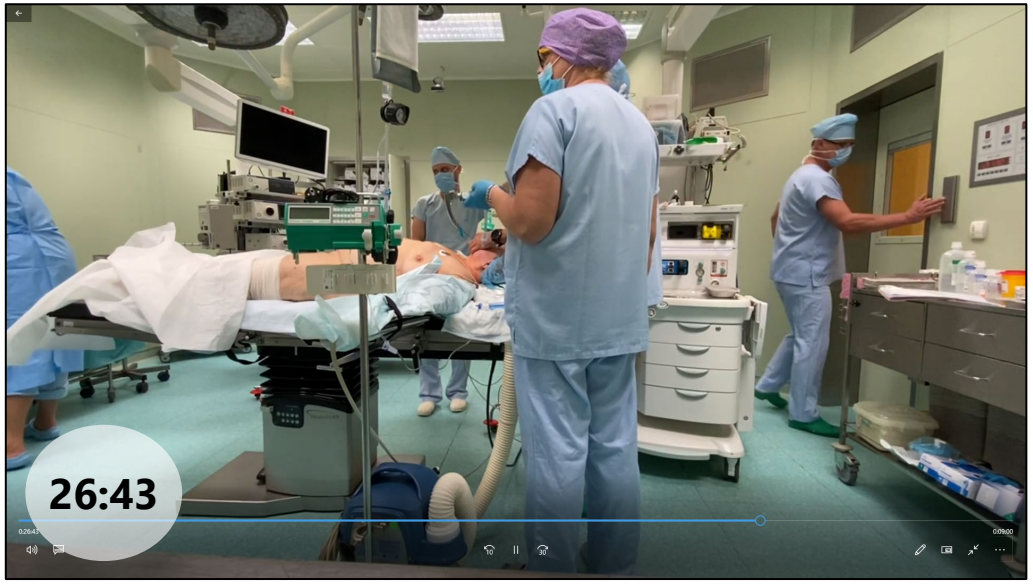
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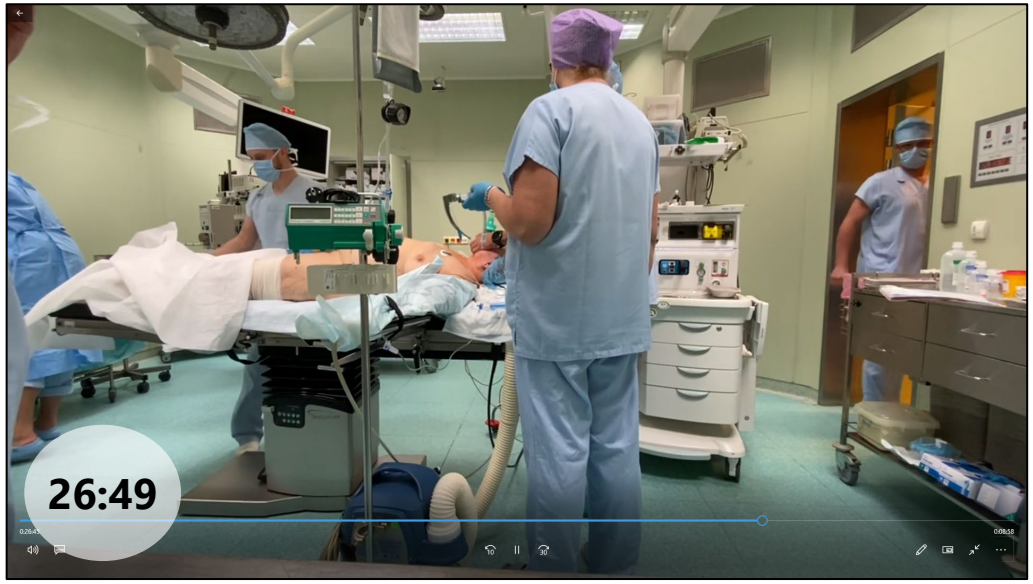
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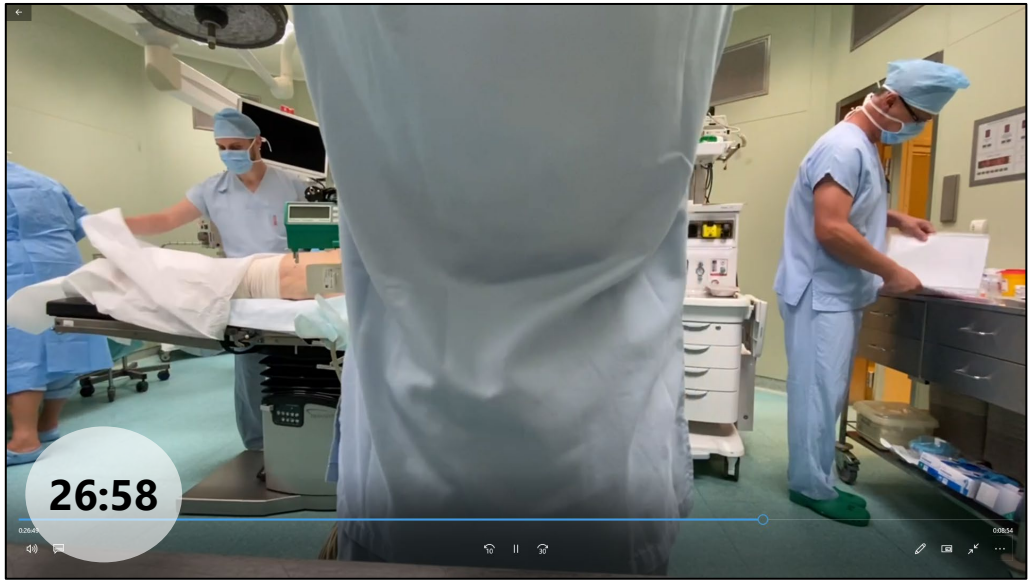
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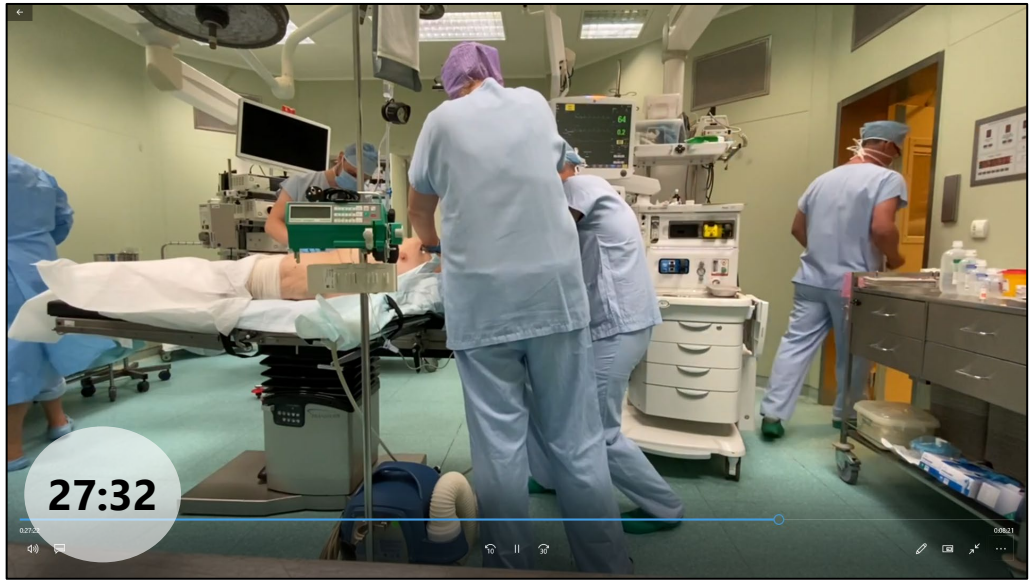
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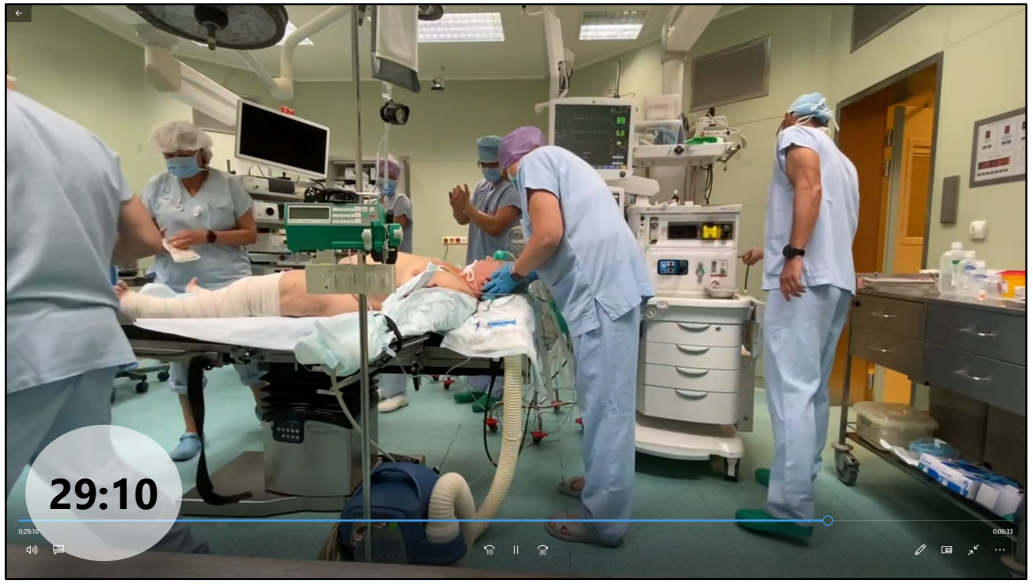
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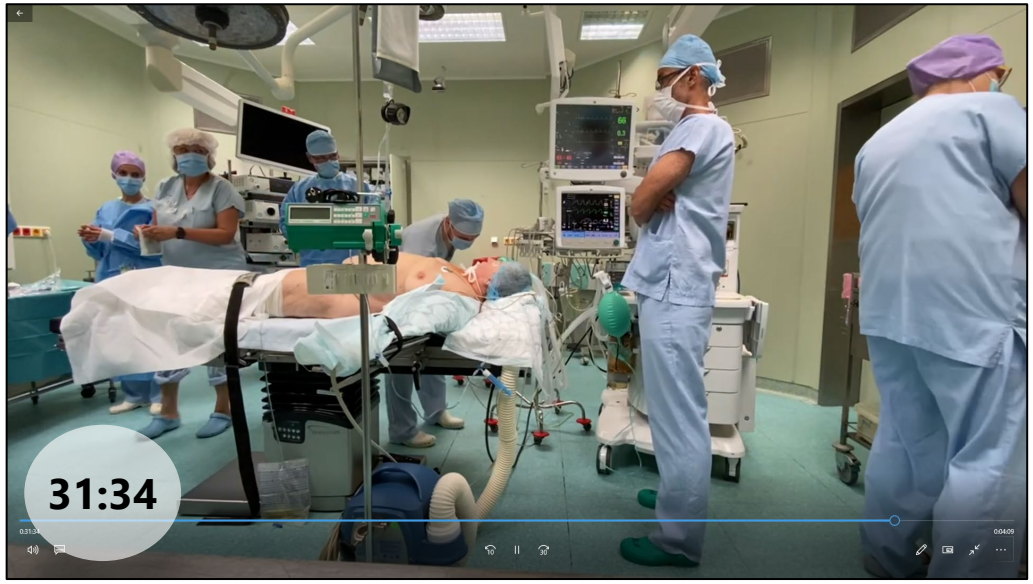
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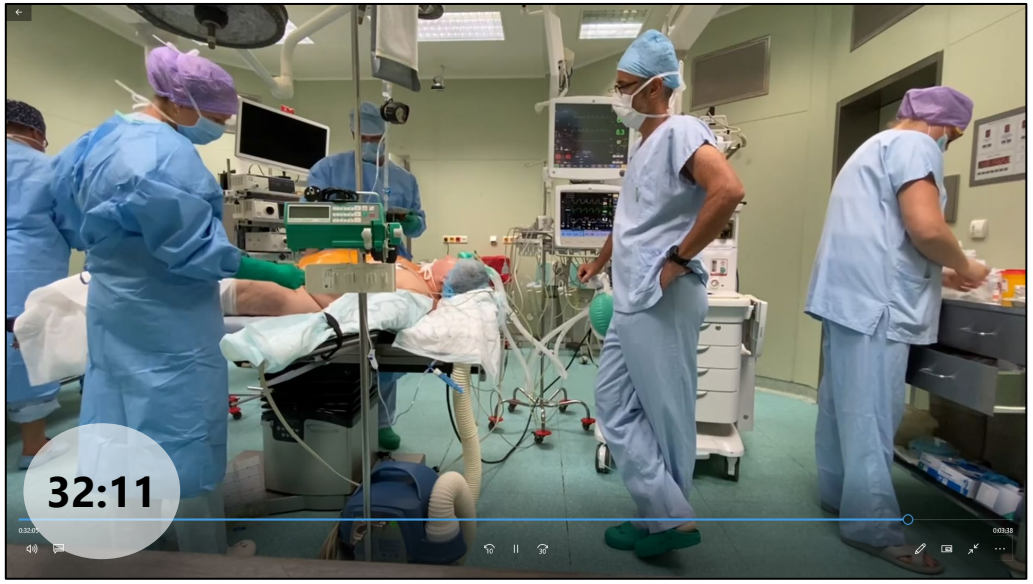
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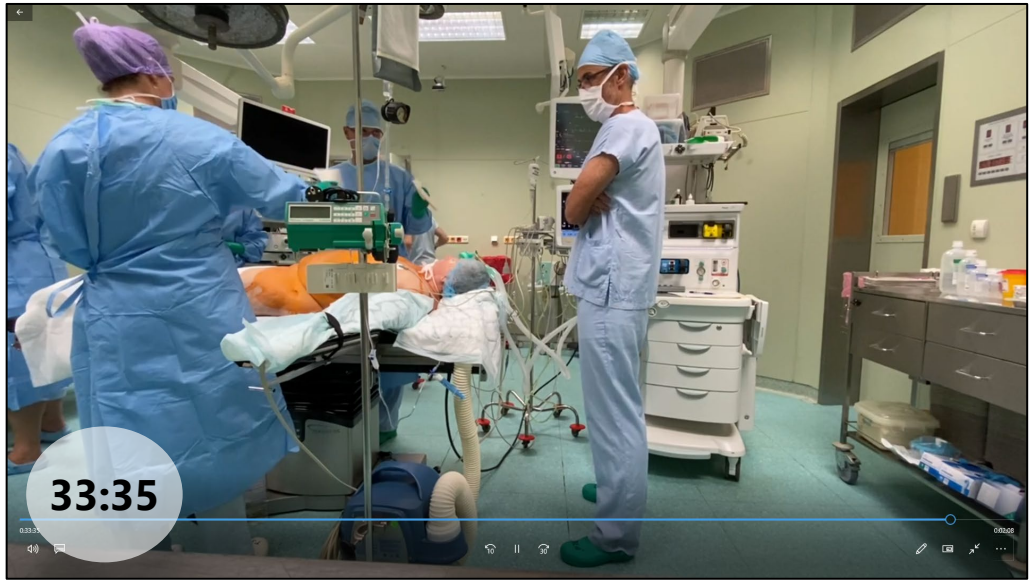
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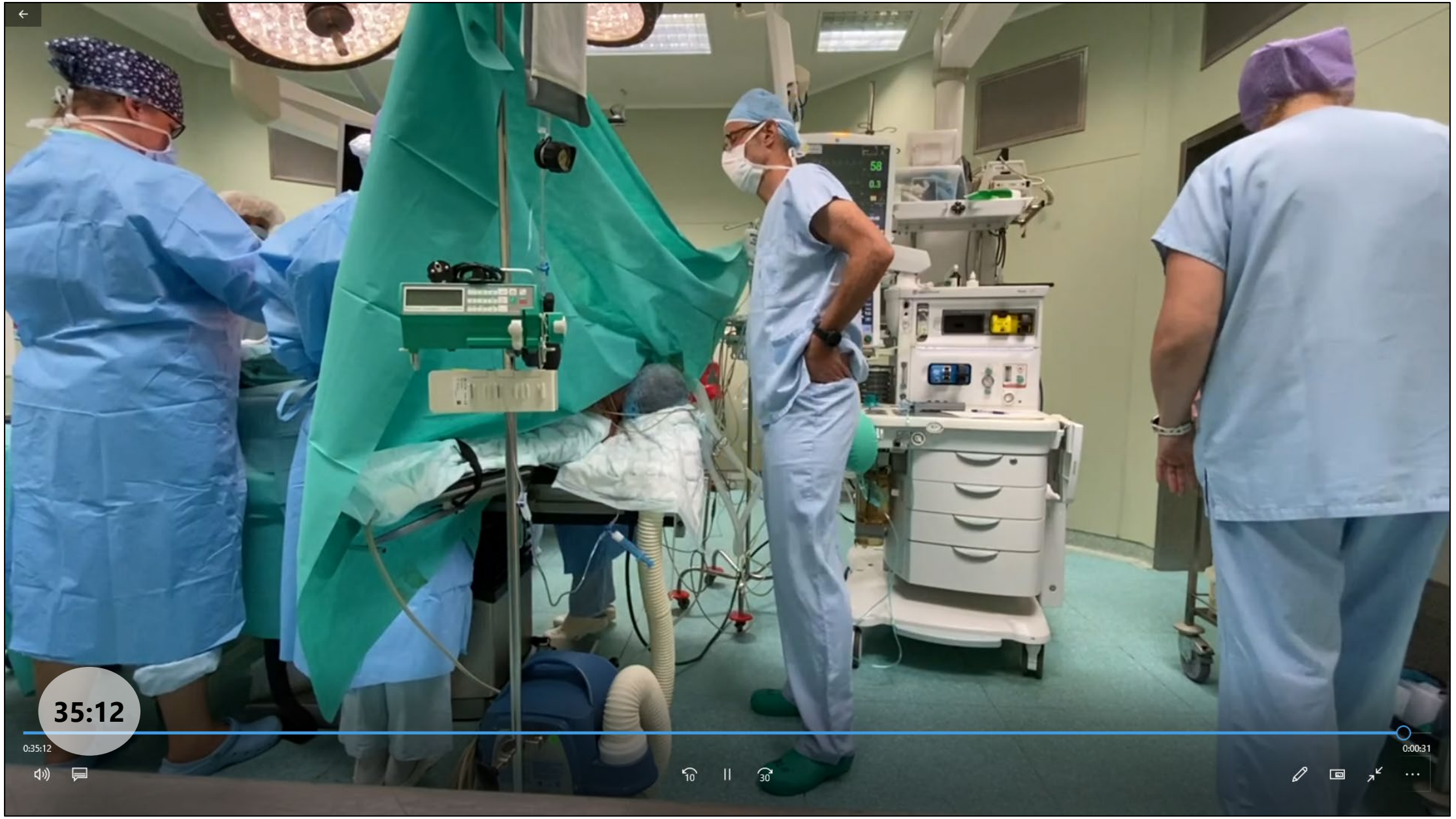
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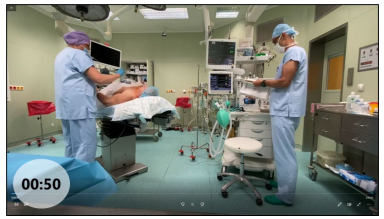

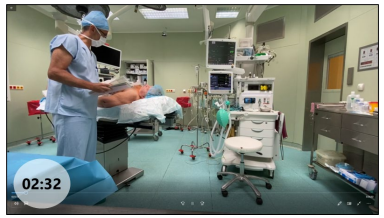

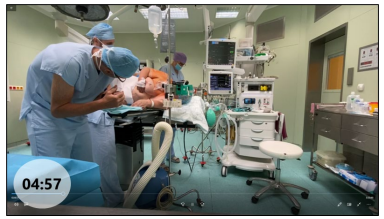

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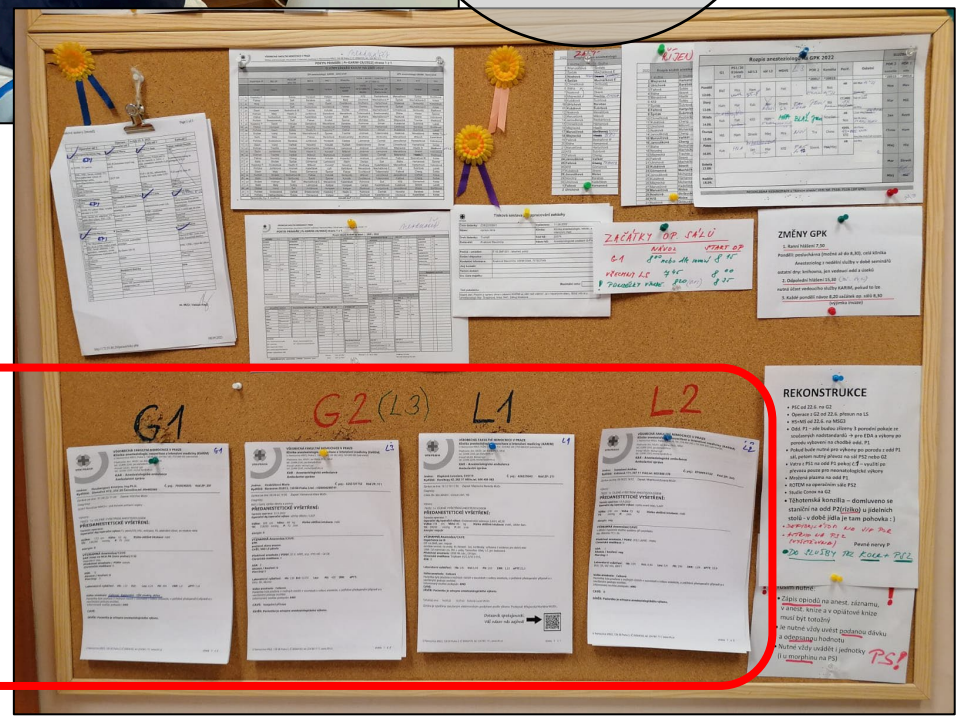
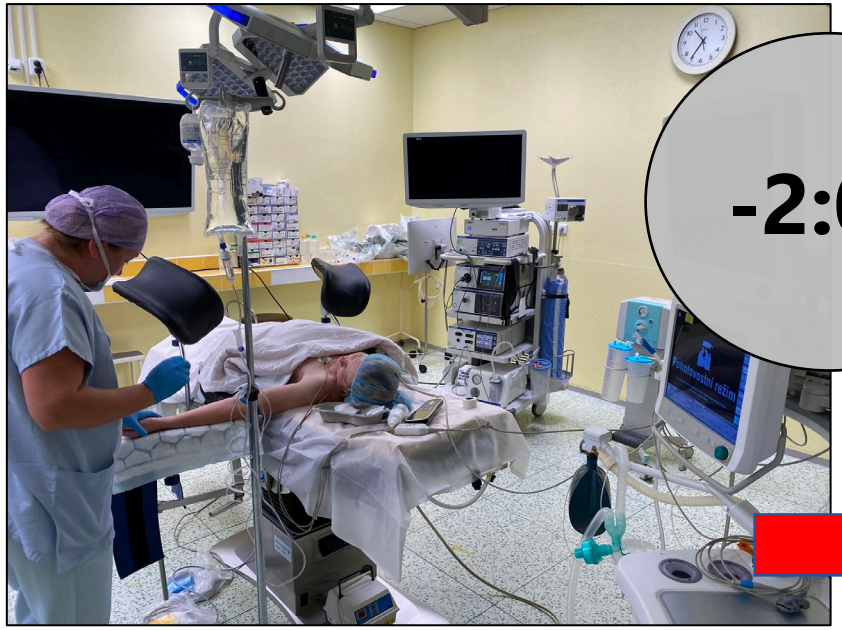


PŘEDANESTETICKÁ PŘÍPRAVA

- **předanestetické vyšetření**
- PBM (korekce anemie)
- prehabilitace

PŘÍPRAVA NA OS

- vše co jde udělat předem, se má udělat předem…



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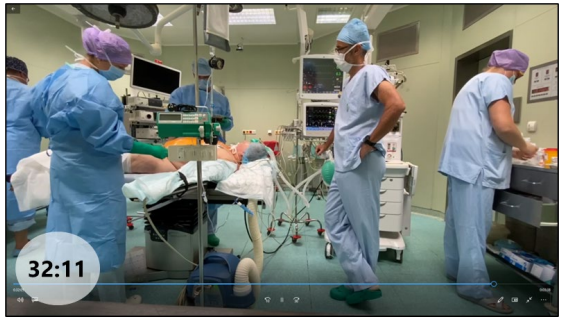

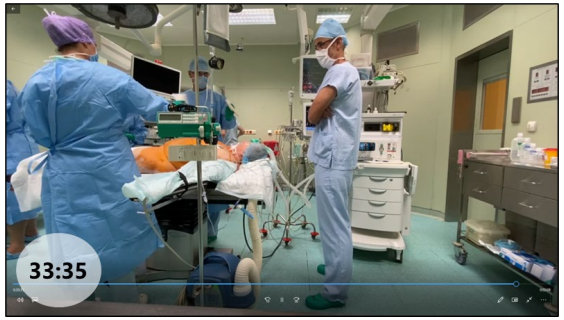

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anesteziolog ztratil

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navezení na sál – incize
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CHEST Transparency in Health Care

Preoperative Briefing in the Operating Room

Shared Cognition, Teamwork, and Patient Safety

Yael Einav, PhD; Daniel Gopher, PhD; Itzik Kara, RN, BSN, MHA; Orna Ben-Yosef, RN, BSN; Margaret Lawn, RN; Neri Laufer, MD; Meir Liebergall, MD; and Yoel Donchin, MD

Contemporary preoperative team briefings conducted to improve patient safety focus mainly on supplying identification details regarding the patient and the surgical procedure. Drawing on cognitive theory principles, in this study a briefing protocol was developed that presents a broader perspective model of the patient and the planned procedure. In addition to customary identification details and drug sensitivities, the new briefing also includes review of significant background information, needed equipment, planned surgery stages, and so forth. The briefing content was developed following 130 continuous, nonstructured observations conducted in gynecologic and orthopedic operating rooms. The briefing form was designed as a large poster hung in a visible position on the operating room wall. The poster guides the team members (ie, nurses, surgeons, and anesthesiologists) in their conduct. Briefing is conducted orally, and no written records are required. The number of nonroutine events (ie, situations that, if not corrected, might lead to patient harm) observed in the 130 surgeries conducted without briefing was compared with the number of events in 102 surgeries in which briefing was conducted. There was a 25% reduction in the number of nonroutine events when briefing was conducted and a significant increase in the number of surgeries in which no nonroutine event was observed. Team members evaluated the briefing as most valuable for their own work, the teamwork, and patient safety. Following the study, the new briefing format was accepted and adopted for routine use. Team briefings designed to supply a broader-perspective surgery model may be an easy-to-apply tool to reduce the number of nonroutine events during surgery and increase patient safety.

CHEST 2010; 137(2):443–449

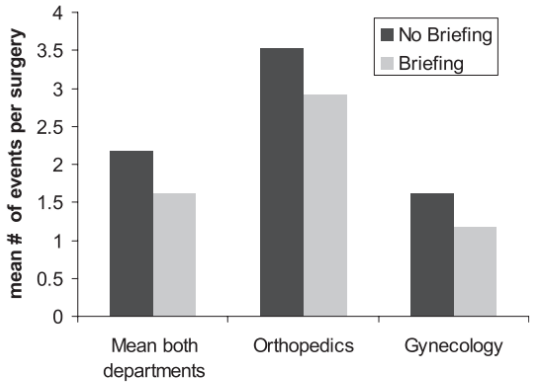

FIGURE 3. Mean number of nonroutine events per surgery.

Table 1—*Nonroutine Events*

Category of Nonroutine Event	Examples
1. Information	Missing hemoglobin value prior to surgery
	Wrong radiograph on screen
2. Lack of situation awareness (knowing what is happening during surgery)	The anesthesiologist begins to wake the patient up while the surgeon declares that they are actually in the middle of the procedure rather than at the end
3. Equipment improperly assembled or not prepared on time	The diameter of the laparoscope is too big
	The laparoscopic screen is not properly connected
4. Problems with teamwork	Patient moved to recovery without the anesthesiologist who is busy completing paperwork
	The surgeon requests an additional instrument, but there is no response from the circulating nurse
	The nurse tilts the table at the end of surgery without coordinating with the anesthesiologist
5. Compliance with procedures	Surgeons begin skin closure before the nurses finish their count
6. Lack of operational knowledge	Nurse does not know how to operate the fluid regulator
7. Equipment failure	Drill does not work


Další akce
Akce
Zážitek, zkušenost.
Ohlédnutí
Co se dělo?
Plán
pro příště
Jak budeme postupovat
v další (podobné) akci?
Zhodnocení
Co jsme dělali dobře?
Co se nedařilo?

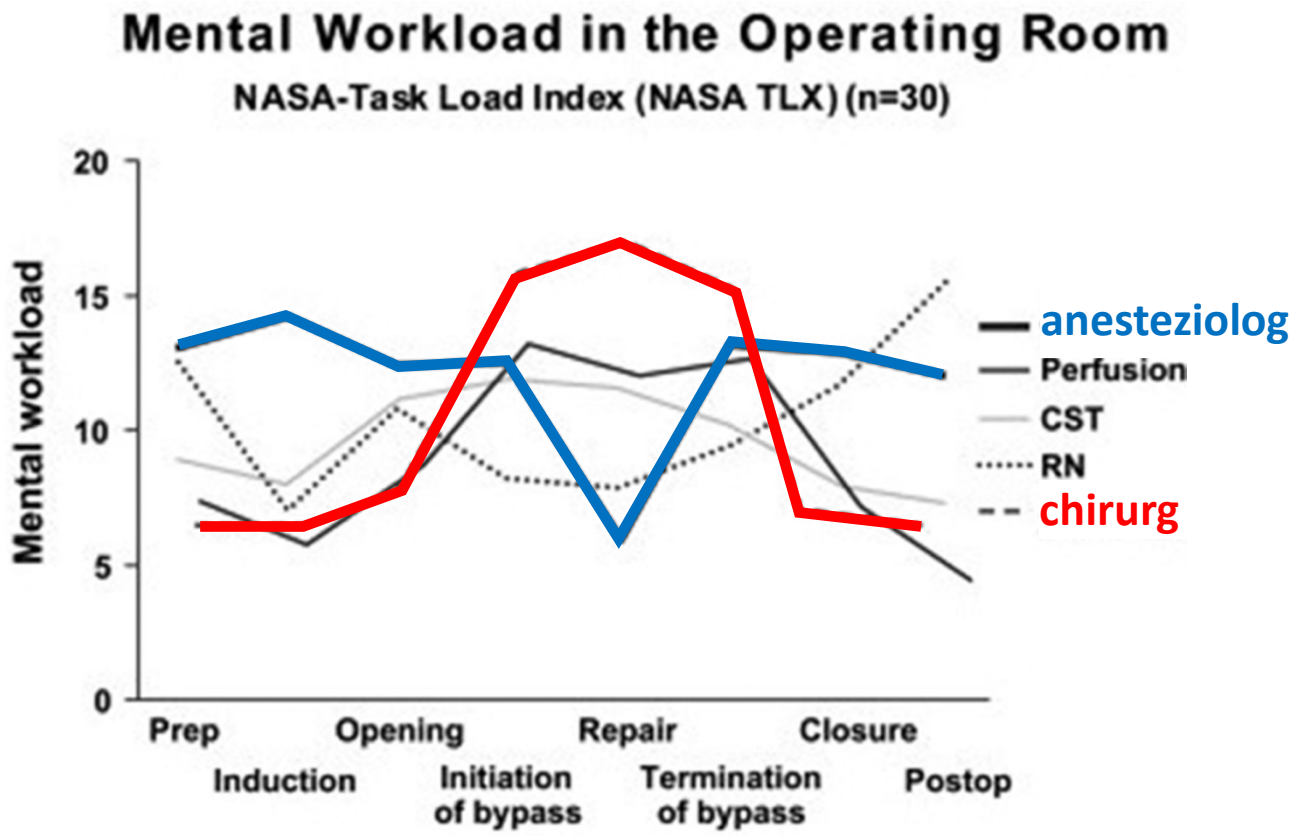

Figure 4: Mental workload in the cardiac surgery operating room varies across the cardiac surgery procedure for individual providers depending on task complexity and responsibilities. CRNA indicates certified registered nurse anesthetist; CST, certified surgical technologist; NASA, National Aeronautics and Space Administration; Postop, postoperative; Prep, surgical preparation; RN, registered nurse; and TLX, Task Load Index. Reprinted from Wadhera et al263 with permission from Elsevier. Copyright © 2010, The American Association for Thoracic Surgery.

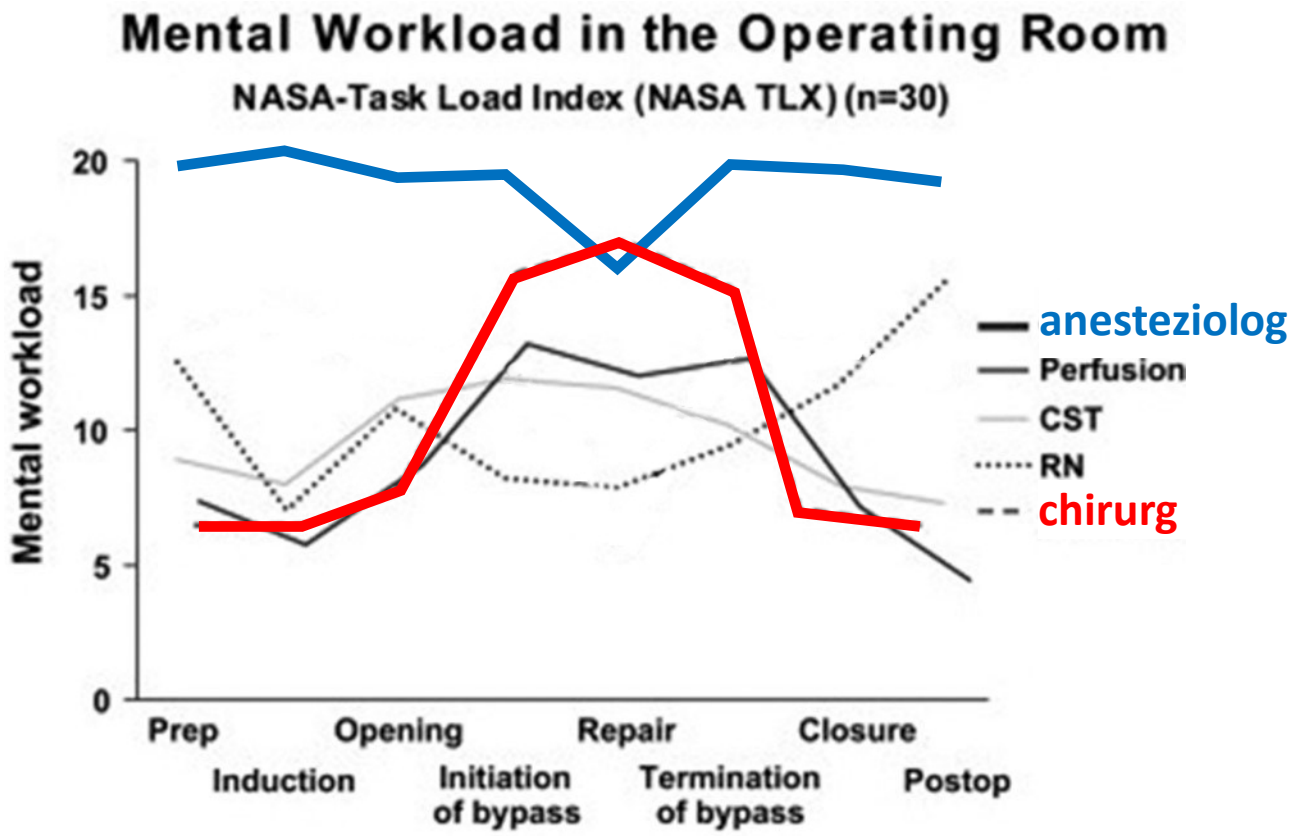

Figure 4: Mental workload in the cardiac surgery operating room varies across the cardiac surgery procedure for individual providers depending on task complexity and responsibilities. CRNA indicates certified registered nurse anesthetist; CST, certified surgical technologist; NASA, National Aeronautics and Space Administration; Postop, postoperative; Prep, surgical preparation; RN, registered nurse; and TLX, Task Load Index. Reprinted from Wadhera et al263 with permission from Elsevier. Copyright © 2010, The American Association for Thoracic Surgery.

Table 2: Reasons for rescheduling surgery – according to anesthesiologists and surgeons

Reasons for cancelling operation	Anesthesiologists (%)	Surgeons (%)
• Necessity for additional tests	79	88
• Patient requires intensive treatment	80	52
• Lack of blood for transfusion	74	36
• Lack of skills	03	30
• Lack of drugs or equipment	12	04
• Reluctance to work	03	54

anesthesiologist

noun | an·es·the·si·ol·o·gist | \-ˌthē-zē-ˈä-lə-jist\

Definition of ANESTHESIOLOGIST

: a physician specializing in anesthesiology

anesthetist

noun | anes·the·tist | \ə-ˈnes-thə-tist , *British* -ˈnēs-\

Definition of ANESTHETIST

: one who administers anesthetics

anesthesiologist

noun | an·es·the·si·ol·o·gist | \-ˌthē-zē-ˈä-lə-jist\

Defin

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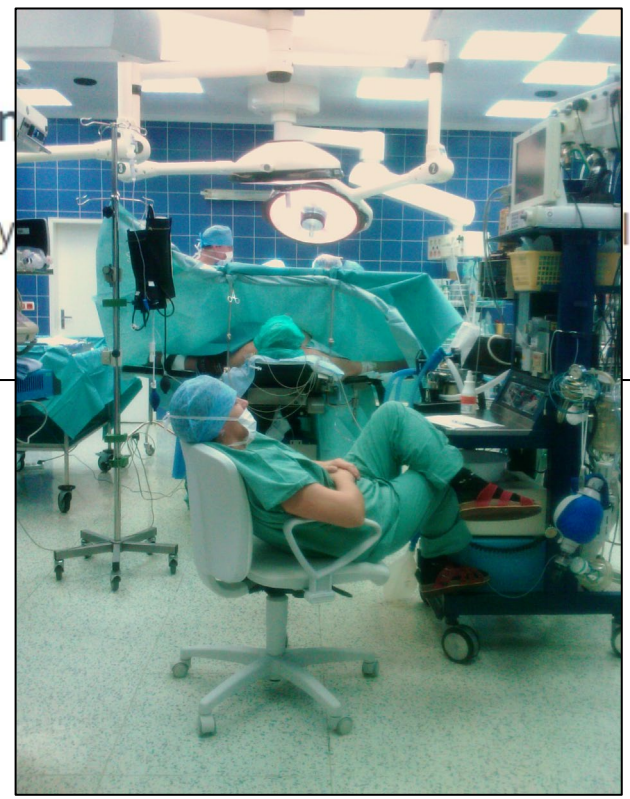

Dallas Observer SUPPORT US *Dallas' independent source of local news and culture* ACCOUNT >

| COURTS |

Dallas Anesthesiologist Being Sued Over Deadly Surgery Admits to Texting, Reading iPad During Procedures

ERIC NICHOLSON | APRIL 1, 2014 | 9:08AM

Mary Roseann Milne, 61, checked into Medical City Dallas on April 13, 2011 for an operation to correct an irregular heartbeat. The procedure, an AV node ablation, is routine, at least as far as heart surgeries go, but something went wrong. Ten hours after her surgery began, Milne was pronounced dead.

The family has filed a medical malpractice suit against Medical City and two individual doctors involved in the procedure: surgeon Dr. Robert Rinkenberger and anesthesiologist Dr. Christopher Spillers. It's set to go before a Dallas County jury in September.

One of the claims the jury will decide is whether Milne was a victim of "distracted doctoring" on the part of Spillers, a point that was pushed hard by the family's attorney, Maria Wormington, during depositions in the case. The depositions provide a clear window into the roles personal technology and social media can play in the operating room.

Sections The Washington Post *Democracy Dies in Darkness*

Health & Science By Shefali Luthra July 13, 2015

Do cellphones belong in the operating room?

(MICHAEL HIRSHON FOR THE WASHINGTON POST)

Medical Xpress

Topics Conditions

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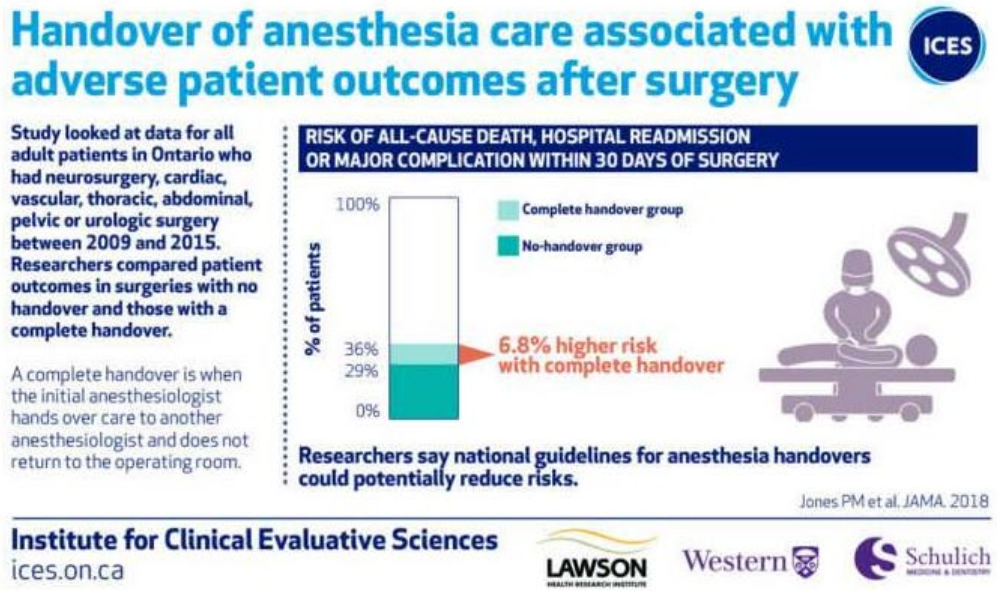
FEBRUARY 9, 2018

Study spotlights risks in anesthesiologist handoffs

by Adela Talbot, University of Western Ontario



Most patients are totally unaware that the anesthesiologist who put them under for surgery might not be the same one who brings them out even though that 'handoff' between the two doctors has been linked to a series of negative patient outcomes, including an increased likelihood of death.

JAMA | Original Investigation

Association Between Handover of Anesthesia Care and Adverse Postoperative Outcomes Among Patients Undergoing Major Surgery

Philip M. Jones, MD, MSc; Richard A. Cherry, MD; Britney N. Allen, MSc; Krista M. Bray Jenkyn, PhD; Salimah Z. Shariff, PhD; Suzanne Flier, MD, MSc; Kelly N. Vogt, MD, MSc; Duminda N. Wijeysundera, MD, PhD

IMPORTANCE Handing over the care of a patient from one anesthesiologist to another occurs during some surgeries and might increase the risk of adverse outcomes.

OBJECTIVE To assess whether complete handover of intraoperative anesthesia care is associated with higher likelihood of mortality or major complications compared with no handover of care.

DESIGN, SETTING, AND PARTICIPANTS A retrospective population-based cohort study (April 1, 2009-March 31, 2015 set in the Canadian province of Ontario) of adult patients aged 18 years and older undergoing major surgeries expected to last at least 2 hours and requiring a hospital stay of at least 1 night.

EXPOSURE Complete intraoperative handover of anesthesia care from one physician anesthesiologist to another compared with no handover of anesthesia care.

MAIN OUTCOMES AND MEASURES The primary outcome was a composite of all-cause death, hospital readmission, or major postoperative complications, all within 30 postoperative days. Secondary outcomes were the individual components of the primary outcome. Inverse probability of exposure weighting based on the propensity score was used to estimate adjusted exposure effects.

RESULTS Of the 313 066 patients in the (was 60 (16) years; 49% of surgeries were perfor re elective; and the median duration of sur 124-255). A total of 5941 (1.9%) patients anesthesia care. The percentage of patients undergoing surgery with a handover of anesthesiology care progressively increased each year of the study, reaching 2.9% in 2015. In the unweighted sample, the primary outcome occurred in 44% of the complete handover group compar complete handovers were statistica imary outcome (adjusted risk all-cause death (aRD, 1.2% [95 aRD, 5.8% [95% CI, 3.6% to 7.9%] ays of surgery (aRD, 1.2% [95% CI, −0.3% to 2.7%]; P = .11).

CONCLUSIONS AND RELEVANCE Among adults undergoing major surgery, complete handover of intraoperative anesthesia care compared with no handover was associated with a higher risk of adverse postoperative outcomes. These findings may support limiting complete anesthesia handovers.

JAMA. 2018;319(2):143-153. doi:10.1001/jama.2017.20040

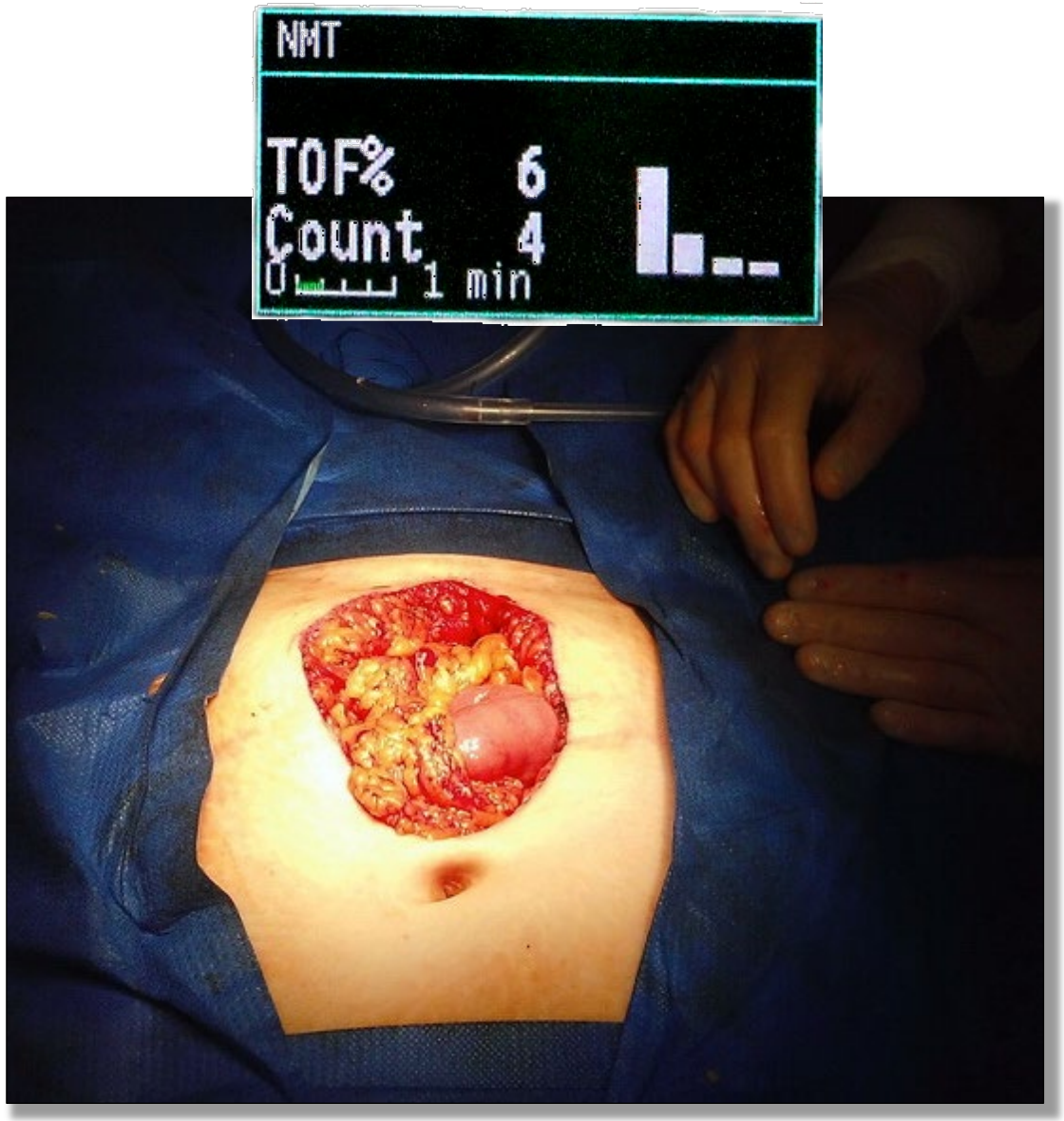
3% anestezií bylo „předáno“

závažné komplikace 3.6 vs. 8% !

PROČ MÁME VĚTŠINOU PROBLÉMY

1. Přecenění vlastních schopností.
2. Pozdní volání o pomoc.
3. Nedostatečně promyšlený postup bez řádného záložního plánu.
4. Špatná / nedostatečná komunikace s ostatními.


TEĎ JSEM PŘIDAL …
TEĎ NA KONCI ? TO TAK… !
👎!💣✳🎯☠👉♦ !!!
TLAČÍ !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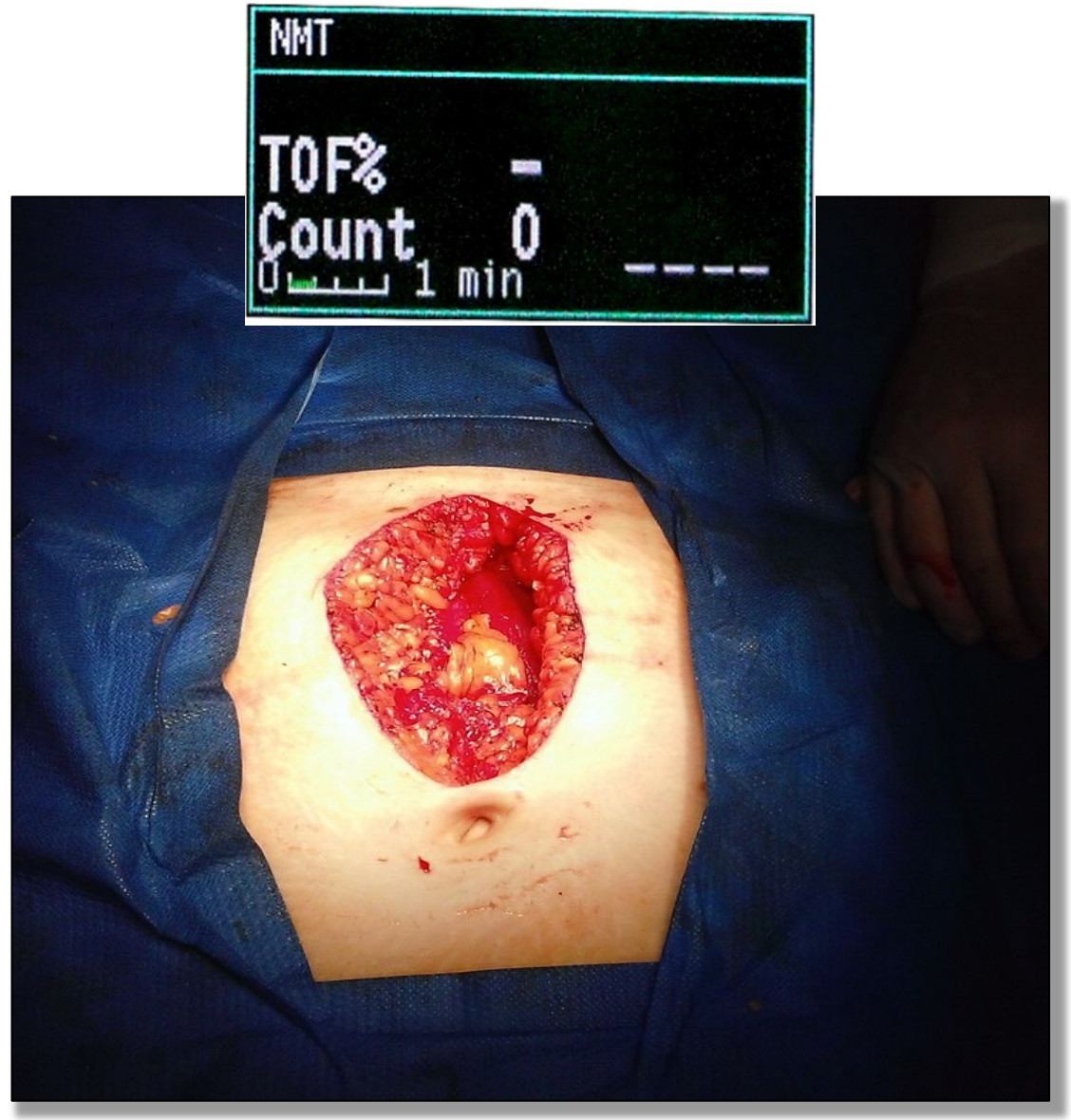
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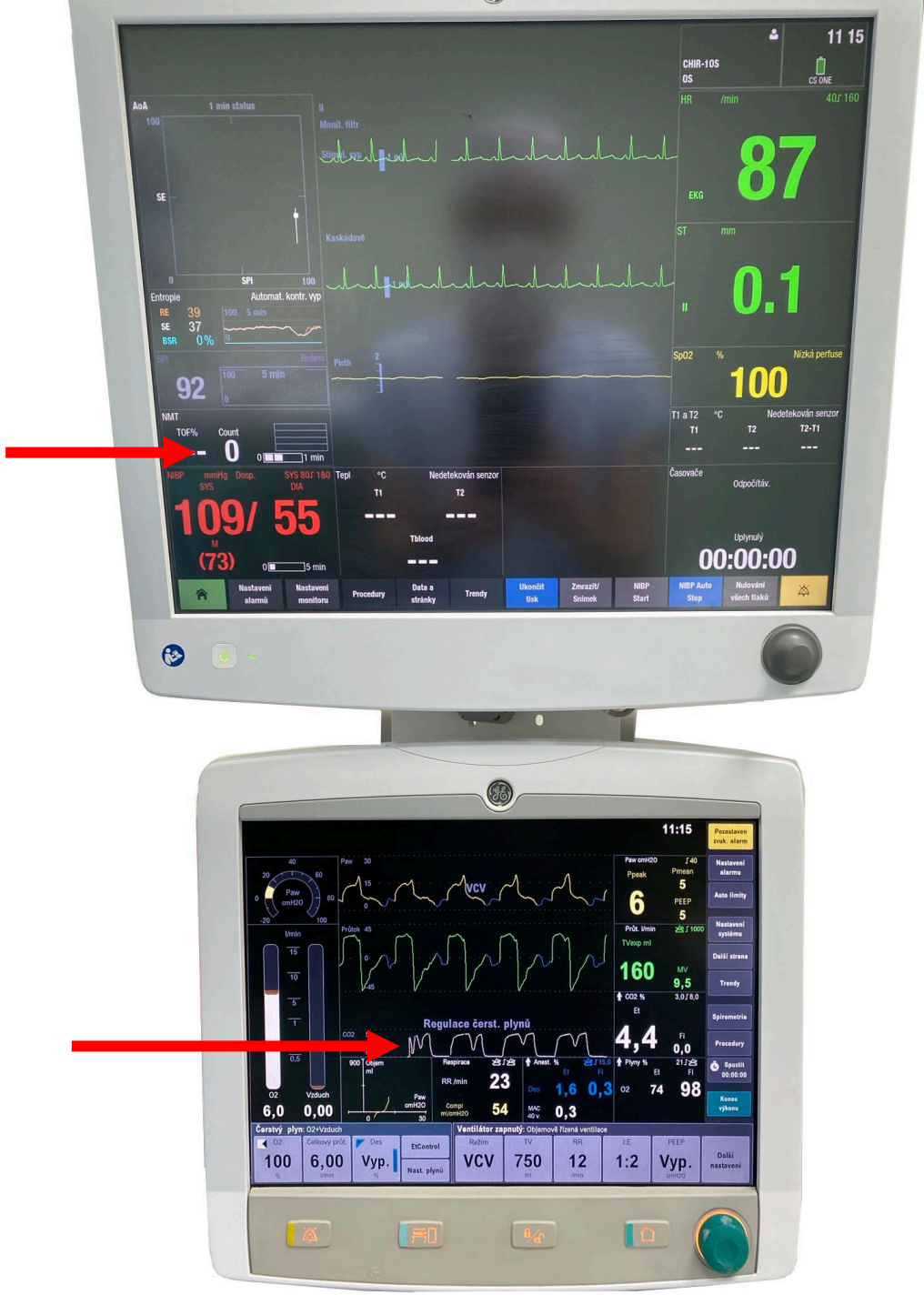
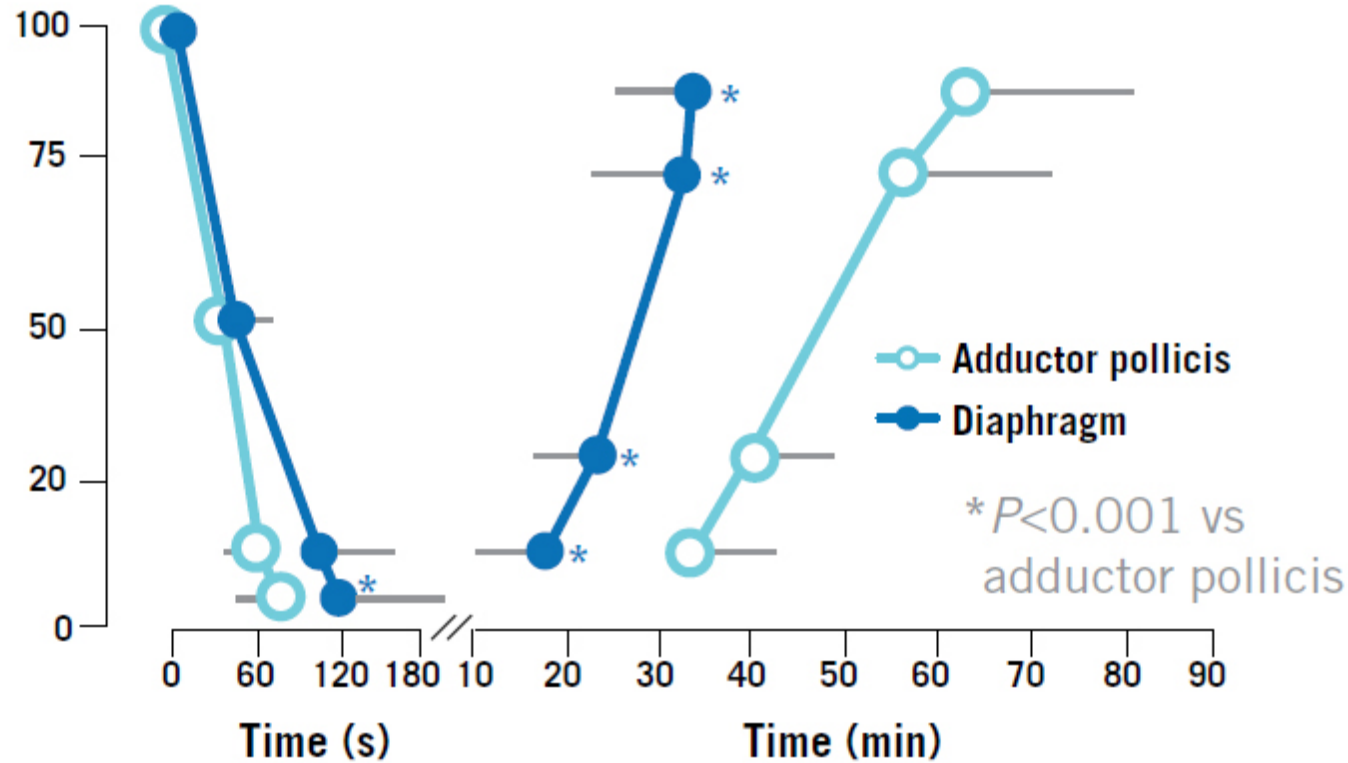
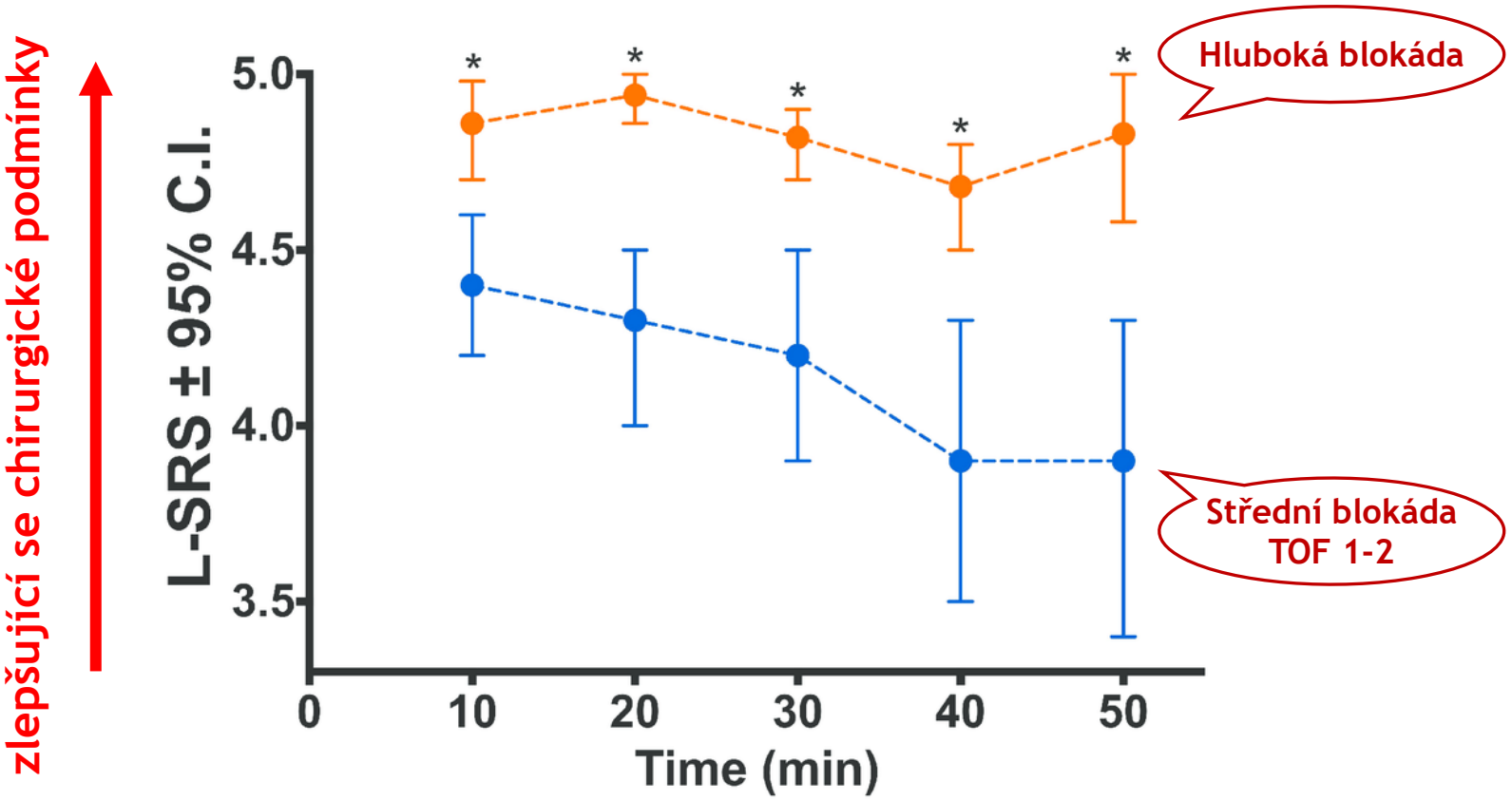




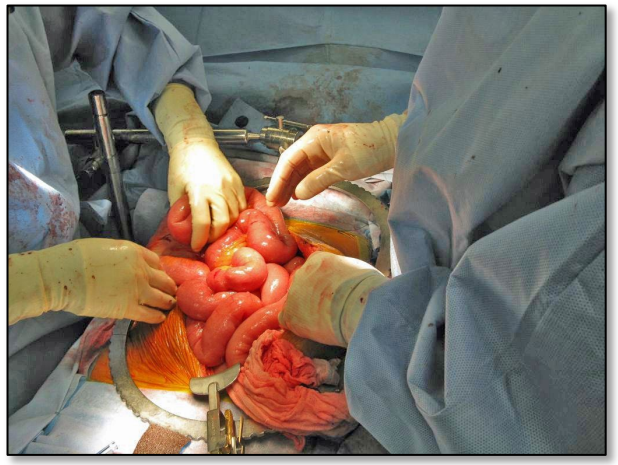
Cantineau et al. Anesthesiology. 1994;81(3):585–590.

Deep Neuromuscular Block Improves Surgical Conditions during Bariatric Surgery and Reduces Postoperative Pain: A Randomized Double Blind Controlled Trial



Influence of deep relaxation on surgical conditions. Leiden-surgical rating scale (L-SRS) values of patients during a deep neuromuscular block (target PTC 2–3; orange, n = 50) and during a moderate neuromuscular block (target TOF 1–2; blue, n = 50). Values are mean (95% confidence interval) with confidence intervals derived from bootstrap analyses. * Mann-Whitney-U test $p < 0.01$ versus moderate block.

doi:10.1371/journal.pone.0167907.g002



Score	Interpretation	Treatment group	
		Moderate block	Deep block
5	Optimal conditions	10%	70%
4	Good conditions	20%	20%
3	Acceptable conditions	55%	10%
2	Poor conditions	10%	0%
1	Extremely poor conditions	5%	0%

Discussion: We aim to show that under the right conditions the perceived opposing goals of surgeons and anesthesiologists (optimal surgical conditions vs. optimal postoperative conditions) may be met without compromise to either.

Boon et al. Trials. 2013 Mar 1;14:63

International Journal of Obstetric Anesthesia (2019) xxx, xxx–xxx
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https://doi.org/10.1016/j.ijoa.2019.08.005

ORIGINAL ARTICLE

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www.obstetanesthesia.com

Surgical conditions with rocuronium versus suxamethonium in cesarean section: a randomized trial

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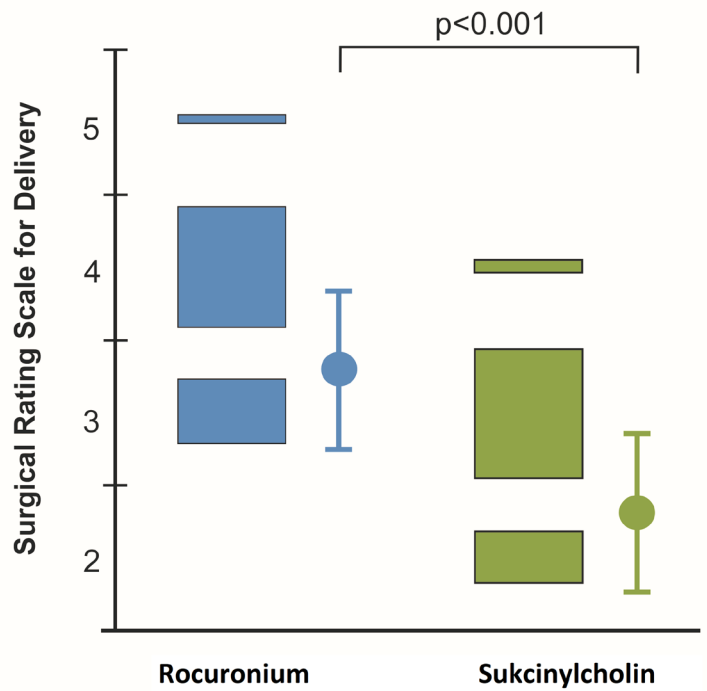


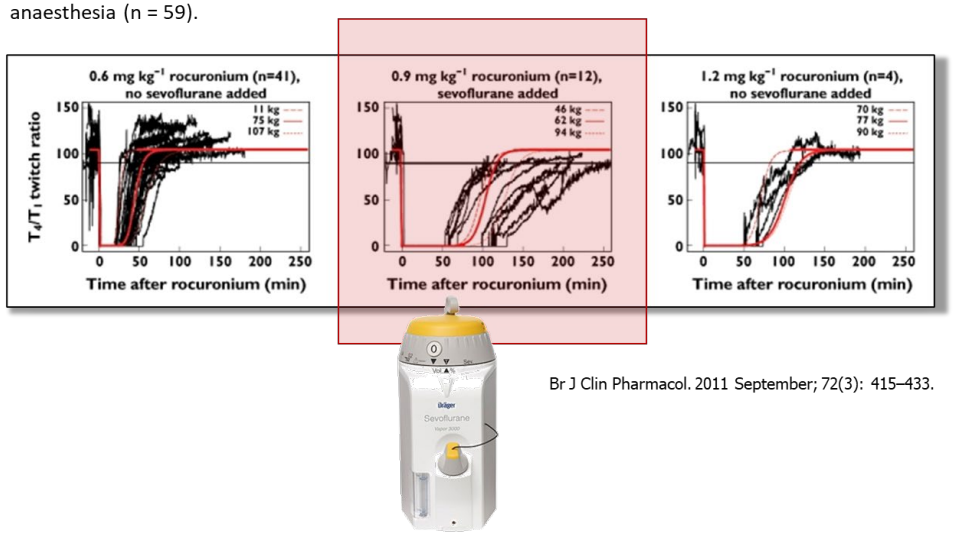
Table 2 Times from induction of anesthesia to end of surgery; and induction characteristics.

	Rocuronium group		Suxamethonium group		*Difference in means*	*P-value*
	Mean	*Median*	*mean*	*median*		
Induction – delivery interval (s)	268.4 (72.9)	265 (223–330)	275.6 (63.4)	267 (239–400)	−7.2 (−39.5 to 19.3)	0.62
Induction – intubation interval (s)	105.8 (33.7)	108 (77–134)	67.6 (32.1)	63 (50–123)	38.2 (24.4 to 52.0)	<0.001
Incision – delivery interval (s)	146.6 (68.3)		[illegible]	201 (167–277)	−49.7 (−74.8 to −24.4)	0.0002
Intubation – incision interval (min)	15.8 (6.9)			10 (3–29)	4.1 (0.4 to 7.8)	0.061
Length of surgery (min)	39.3 (8.9)			38 (26–54)	0.1 (−4.0 to 3.8)	0.976
End of surgery to extubation (min)	5.2 (4.6)	4 (0–13)	8.8 (5.8)	8 (2–19)	−3.5 (−5.8 to 1.4)	0.002
SRSD (points)	3.73 (0.53)	4 (3–5)	2.77 (0.55)	3 (2–4)	1.0 (−0.01 to 0.20)	<0.001
Blood loss (mL)	533 (76)	500 (500–600)	538 (98)	500 (500–650)	−5 (−38 to 28)	0.859
Thiopental (mg/kg)	4.7 (0.16)	4.7 (4.5–5.1)	4.7 (0.21)	4.7 (4.5–5.3)		0.471
Muscle relaxant dose (mL/kg)	0.092 (0.01)	0.093 (0.090–0.106)	0.095 (0.00)	0.094 (0.09–0.106)		0.072
Muscle relaxant dose (mg/kg)	0.55 (0.05)	0.56 (0.54–0.65)	0.95 (0.04)	0.94 (0.9–0.11)		0.177

čas incize - porod
146 vs. 196 sec

Data are presented as mean (SD) or median (range). Difference between the groups is expressed as median (95% confidence interval). SRSD: Surgical rating scale for delivery.

Figure 5. Graphs show the observed T4/T1 twitch ratio upon spontaneous neuromuscular blockade reversal following rocuronium administration, conditioned on administered dose and use of sevoflurane anaesthesia (n = 59).



Br J Clin Pharmacol. 2011 September; 72(3): 415–433.

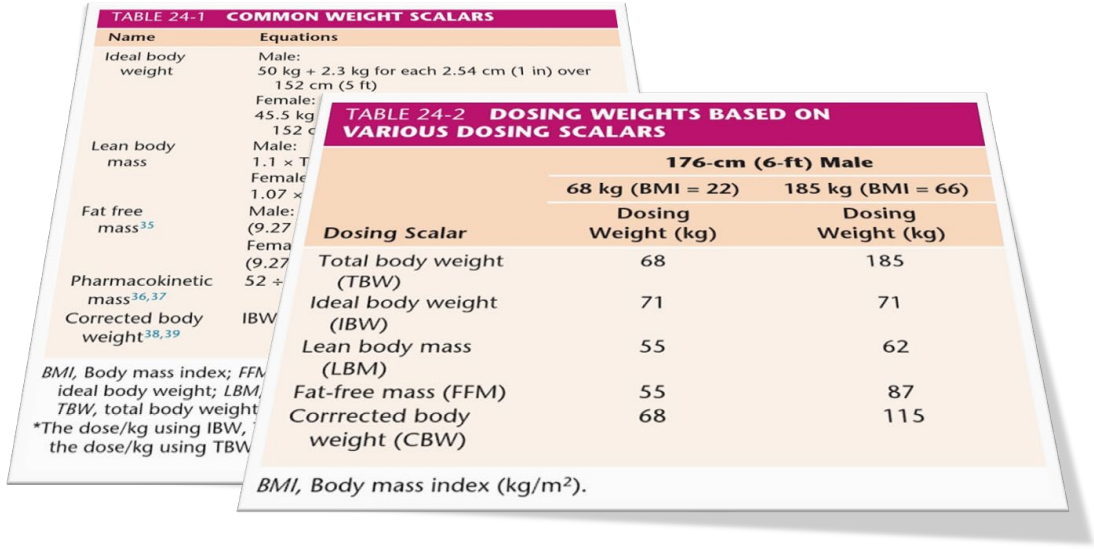


TABLE 24-1 COMMON WEIGHT SCALARS

Name	Equations
Ideal body weight	Male: 50 kg + 2.3 kg for each 2.54 cm (1 in) over 152 cm (5 ft) Female: 45.5 kg 152 c
Lean body mass	Male: 1.1 × T Female 1.07 ×
Fat free mass[35]	Male: (9.27 Fema (9.27
Pharmacokinetic mass[36,37]	52 ÷
Corrected body weight[38,39]	IBW

BMI, Body mass index; *FFM* ideal body weight; *LBM*, *TBW*, total body weight
*The dose/kg using IBW, the dose/kg using TBW

TABLE 24-2 DOSING WEIGHTS BASED ON VARIOUS DOSING SCALARS

	176-cm (6-ft) Male	
	68 kg (BMI = 22)	185 kg (BMI = 66)
Dosing Scalar	Dosing Weight (kg)	Dosing Weight (kg)
Total body weight (TBW)	68	185
Ideal body weight (IBW)	71	71
Lean body mass (LBM)	55	62
Fat-free mass (FFM)	55	87
Corrrected body weight (CBW)	68	115

BMI, Body mass index (kg/m²).

The Prolonged Duration of Rocuronium in Chinese Patients

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We compared the potency and duration of action of rocuronium in Chinese and Caucasian patients during general anesthesia. Thirty-six women (18 Caucasian and 18 Chinese) and 36 children (18 Caucasian and 18 Chinese) were evaluated during the administration of propofol/fentanyl anesthesia. Patients in each age group were randomized into three subgroups to receive single doses of 0.06, 0.12, or 0.18 mg/kg rocuronium (adults) or 0.12, 0.18, or 0.24 mg/kg rocuronium (children). Neuromuscular blockade was assessed by electromyography of the adductor pollicis after train-of-four (TOF) stimulation of the ulnar nerve. Dose response curves were constructed when maximum neuromuscular depression of the first twitch of the train (T_1) was obtained. A second bolus dose of rocuronium was then administered to a total dose of 0.6 mg/kg. The times of spontaneous recovery to T_1 10%, 25%, and 90% of control and to TOF 0.25, 0.50, and 0.70 were recorded. For both adults and children, recovery occurred later in Chinese than in Caucasian patients ($P < 0.05$ for T_1 of 10%, 25%, 75%, and 90% and TOF to 0.7). The 50% effective dose was smaller in Chinese adults (125 ± 63 vs 159 ± 66 μg/kg) and Chinese children (171 ± 43 vs 191 ± 46 μg/kg) than in Caucasian adults and children, but the difference was not statistically significant. In adults, time to 25% T_1 recovery was 43 ± 13 min in Chinese patients and 33 ± 10 min in Caucasian patients ($P < 0.05$). The corresponding values were more rapid for children: 30 ± 10 and 24 ± 6 min ($P < 0.05$). We conclude that the recovery from rocuronium neuromuscular blockade was longer in Chinese compared with Caucasian patients and in adults compared with children.

(Anesth Analg 2000;91:1526–30)

Table 2. Pharmacodynamic parameters.

	men (*n = 121*)	women (*n = 124*)
ONSET TIME (seconds)	104.7 (12.2)	92.5 (14.2)***
CLINICAL DURATION (minutes)	31.3 (5.5)	43.1 (7.9)***
RECOVERY INDEX (minutes)	14.8 (4.0)	14.7 (5.0)

Data are means (SD – standard deviation), ***p < 0.0001

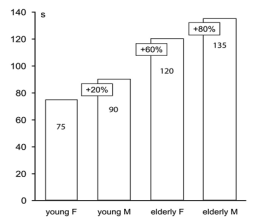

Fig. 2. Onset time in seconds (= time interval from the completion of the intravenous injection of rocuronium to maximal T_1 depression in TOF-stimulation).
Data are medians. The percentage values describe the increase compared to young females.
M = males, F = females, Young = age 20-40 yrs, Elderly = 60-75 yrs

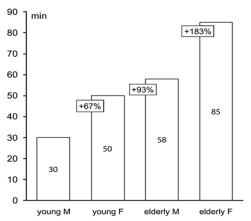

Fig. 3. Clinical duration in minutes (= time interval from the completion of the intravenous injection of rocuronium to spontaneous recovery of T_1 to 25% of the control value in TOF-stimulation).
Data are medians. The percentage values describe the increase compared to young males.
M = males, F = females, Young = age 20-40 yrs, Elderly = 60-75 yrs

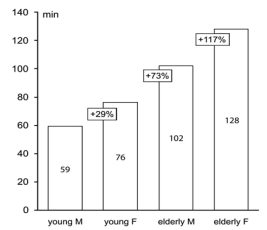

Fig. 4. Interval to full recovery in minutes (= interval from the completion of the intravenous injection of rocuronium to spontaneous recovery to TOF-ratio 0.90, which reflects complete recovery from the block).
Data are medians. The percentage values describe the increase compared to young males.
M = males, F = females, Young = age 20-40 yrs, Elderly = 60-75 yrs

Adamus et al. Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub. 2011 Dec; 155(4):347–354.

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.

The RECITE Study: A Canadian Prospective, Multicenter Study of the Incidence and Severity of Residual Neuromuscular Blockade

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Kim Turner, BScPhm, MSc, MD, FRCPC,‡§ Étienne de Médicis, MD, FRCPC,‖ Brian Warriner, MD,
FRCPC,¶ Philip M. Jones, MD, FRCPC, MSc,#** Alan Chaput, BScPhm, PharmD, MD, MSc, FRCPC,††
Jean-François Pouliot, PhD,‡‡ and André Galarneau, MSc, PhD‡‡

BACKGROUND: Postoperative residual neuromuscular blockade (NMB), defined as a train-of-

The RECITE Study

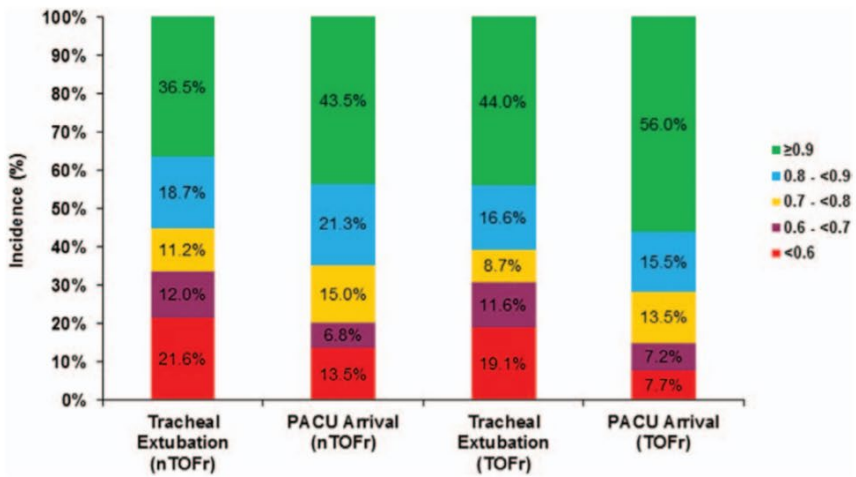

Figure 2. Incidence of residual neuromuscular blockade. nTOFr = normalized train-of-four ratio; TOFr = nonnormalized train-of-four ratio.

CONCLUSIONS: Residual paralysis is common at tracheal extubation and PACU arrival, despite qualitative neuromuscular monitoring and the use of neostigmine. More effective detection and management of NMB is needed to reduce the risks associated with residual NMB. (Anesth Analg 2015;XXX:00–00)

Table 2 Selected reports of postoperative residual paralysis, 2006–2016.

Study	Intermediate-acting NMBA	Reversal	TOF Threshold	Monitoring modality	Residual paralysis	Comments
Cammu et al. [26]	Atrac/Cis/Miv/Roc		0.9	Clinical		One of 320 inpatients
	Outpatients	In 26%		(49% of cases)	38%	required re-intubation
	Inpatients	In 25%			47%	in PACU; Subjective assessment did not decrease incidence of residual paralysis
Maybauer et al. [88]	Cis	None	0.9	AMG	57%	Variability in duration
	Roc		0.9	AMG	44%	of action of Roc greater than Cisatrac
Murphy et al. [89]	Roc	Yes	0.9	AMG	5%	AMG lowers RNMB risk
				Subjective	30%	
Butterly et al. [14]	Vec/Cis	Yes	0.9	Subjective	22%	Less RNMB with Cis
Yip et al. [90]	Atrac/Vec/Roc	In 65%	0.9	Not reported	31%	21% of patients with RNMB required airway support
Murphy et al. [7]	Roc	Yes	0.9	AMG	15%	AMG monitoring lowers
			0.9	Subjective	50%	RNMB
Cammu et al. [91]	Atrac/Roc/Miv		0.9	Subjective		Body mass index we an
		None		(38% of cases)	15%	independent predictor
		Neo			15%	of desaturation in PACU
		SGX			2%	
Kumar et al. [92]		Yes in 100%	0.9	Not performed		RNMB resulted in
	Vec				66%	reductions in forced
	Atrac				60%	vital capacity and peak
	Roc				46%	expiratory flow
Norton et al. [93]			0.9		30%	CRE present in 51% with RNMB
Esteves et al. [94]	Atrac/Cis/Roc/Vec	Yes (67% of patients)	0.9	Subjective	26%	Incomplete recovery more frequent after reversal than no reversal (31% vs. 17%)
Kotake et al. [17]	Roc		0.9	Clinical		RNMB as high as 9%
		None			13%	with SGX without
		Neo			24%	monitoring
		SGX			4%	
Pietraszewski et al. [95]	Roc	None	0.9	Not used	44%	Incidence of RNMB was 44% in elderly and 20% in young patients
Fortier et al. [96]	Roc	Yes	0.9	Optional	64%	Incidence of RNMB was 56% on PACU arrival
Xara et al. [97]	NMBAs used in 66% of patients	Yes	0.9	Optional	18%	CRE more common (46%) in patients with RNMB
Ledowski et al. [98]	Atrac/Roc/Vec	Yes (48% of patients)	0.9	Optional (used in 23% of patients)	28%	RNMB after neo reversal was twice as high as no reversal in paediatric patients
Brueckmann et al. [99]	Roc			Subjective		OR discharge shorter in
		Yes-Neo	0.9		43%	SGX-treated patients
		Yes-SGX	0.9		0%	
Batistaki et al. [18]	Roc/Cis			Clinical		Female gender and
		Yes-Neo	0.9		14.6%	co-morbidities increased
		Yes-SGX	0.9		9.5%	incidence of RNMB

NMBA, neuromuscular blocking agent; TOF, train-of-four; RNMB, residual neuromuscular block; Atrac, atracurium; Cis, cisatracurium; Vec, vecuronium; Roc, rocuronium; Miv, mivacurium; PACU, post-anaesthesia care unit; AMG, acceleromyography; CRE, critical respiratory events; SGX, sugammadex; OR, operating room.

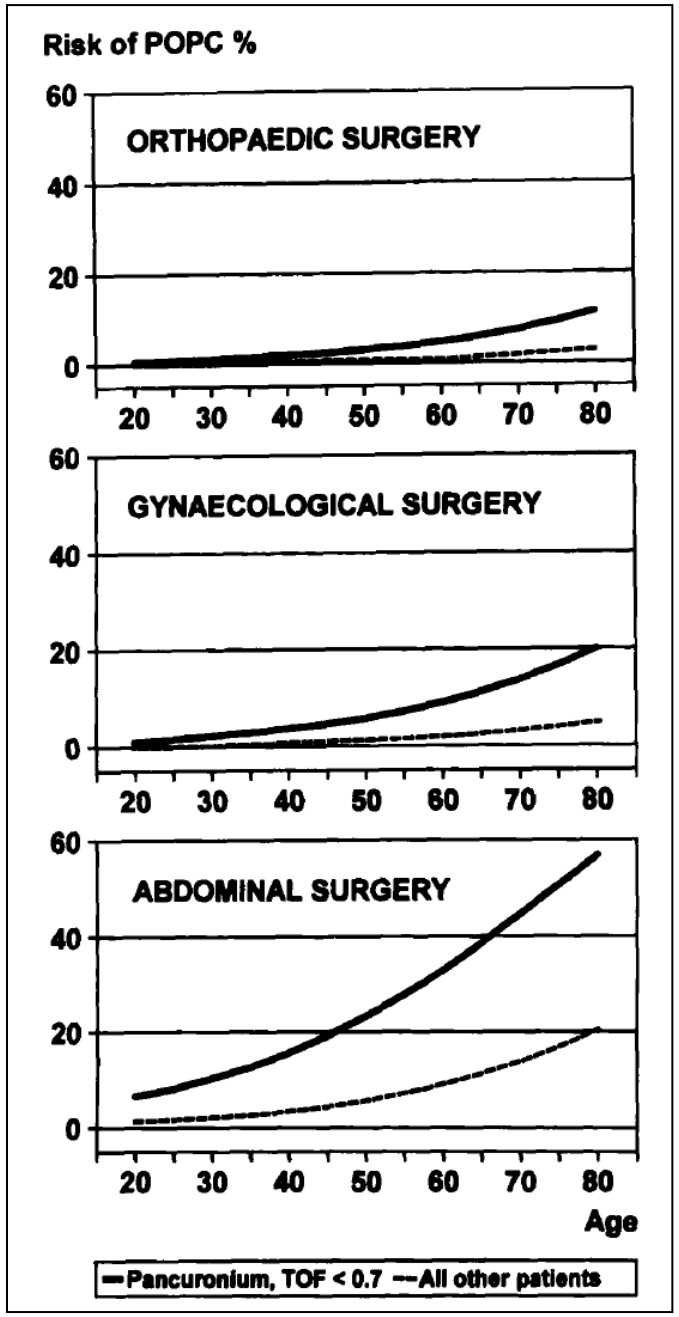

Fig. 4. Predicted probabilities of postoperative pulmonary complications in different age groups in orthopaedic, gynaecological, and major abdominal surgery with a duration of anaesthesia of less than 200 min. The full lines represent patients having residual neuromuscular block (TOF <0.70) following the use of pancuronium, the broken lines patients with TOF ≥0.70 following pancuronium and all atracurium and vecuronium patients, independent of the TOF ratio at end of anaesthesia (see text for further explanation).

Table 5

Comparison between patients with and without POPC. Median values and 25th–75th percentiles are given.

	Patients without POPC (n=644)	Patients with POPC (n=46)	Significance level *P*
Age in years	51.6 (38–66)	65.0 (56–76)	0.000011
Duration of anaesthesia	150 (115–190)	193 (160–230)	0.000027
Duration of surgery	92 (65–130)	121 (90–165)	0.00028
Central temperature at end of anaesthesia (°C)	36.0 (35.6–36.5)	35.7 (35.2–36.2)	0.00084

Berg H et al. Acta Anaesthesiol Scand. 1997 Oct;41(9):1095-1103

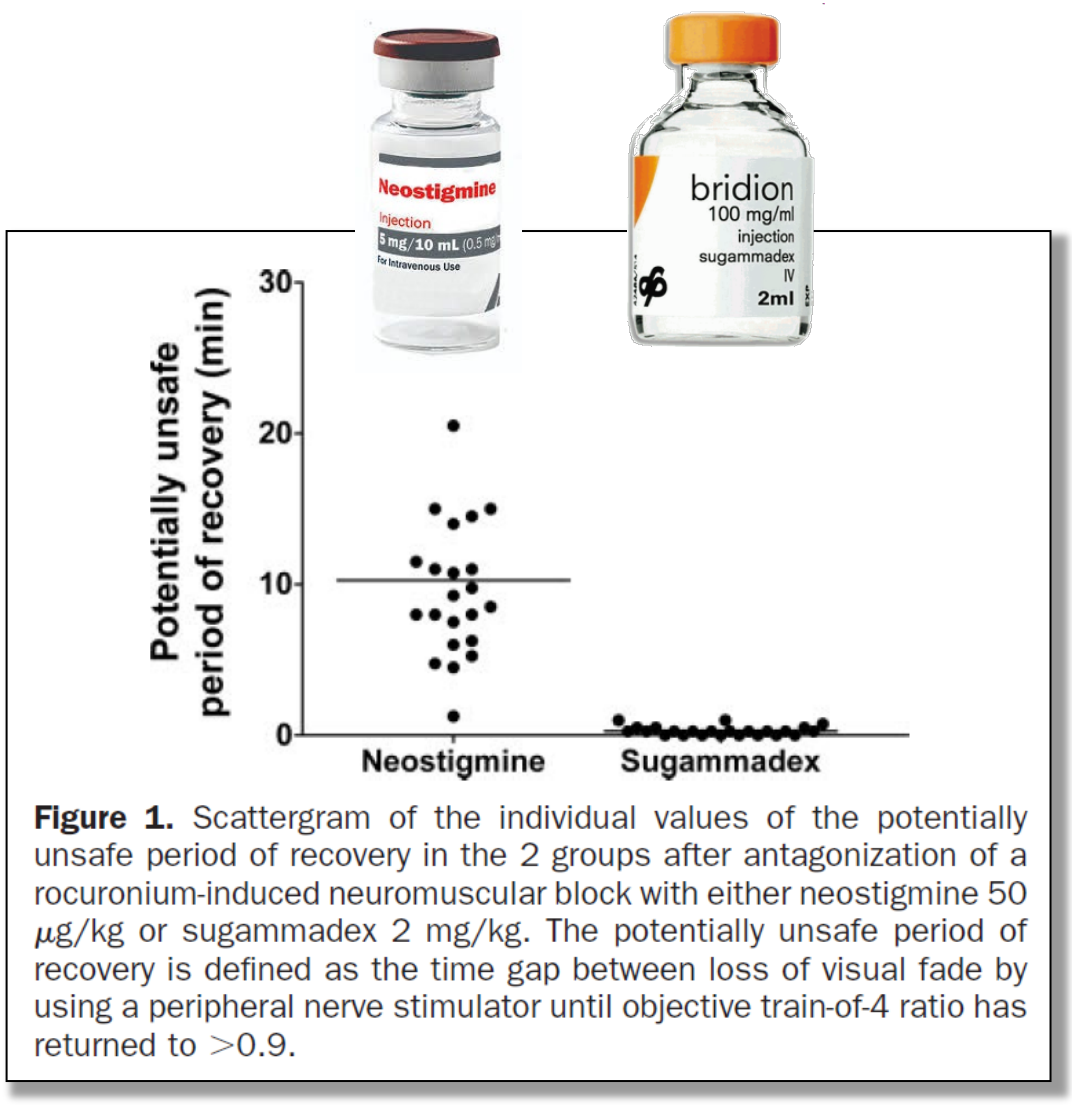

Figure 1. Scattergram of the individual values of the potentially unsafe period of recovery in the 2 groups after antagonization of a rocuronium-induced neuromuscular block with either neostigmine 50 μg/kg or sugammadex 2 mg/kg. The potentially unsafe period of recovery is defined as the time gap between loss of visual fade by using a peripheral nerve stimulator until objective train-of-4 ratio has returned to >0.9.

Illman HL et al. Anesth Analg 2011;112:63–8

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DOPORUČENÝ POSTUP PRO POUŽITÍ SUGAMMADEXU

Východisko

Pooperační reziduální neuromuskulární blokáda (postoperative residual curarization; PORC) je významně komplikující důsledek podání svalové relaxace během operačního výkonu a vyskytuje se až u 20–60% pacientů při příjezdu na jednotka poanestetické péče (PACU). Je spojena se zvýšeným výskytem pooperačních respiračních komplikací, jako je hypoxemie, pneumonie a atelektáza, a s prodlouženou délkou pobytu na PACU i v nemocnici.

CAVE: Neexistuje žádné klinické vyšetření, které spolehlivě posoudí aktuální míru zotavení z neuromuskulární blokády (NMB). Jedinou spolehlivou metodou je přístrojová monitorace.

Rizikové faktory vzniku postanestetických komplikací v souvislosti s PORC:

Na straně pacienta:

- ☐ ASA III a více
- ☐ věk nad 75 let
- ☐ obezita s BMI ≥40
- ☐ neurodegenerativní onemocnění
- ☐ CHOPN / jiné závažné plicní onemocnění se sníženou respirační rezervou
- ☐ Sleep Apnea syndrom
- ☐ závažná polymorbidita
- ☐ PONV v anamnéze

Dle výkonu:

- ☐ laparoskopické výkony
- ☐ bronchoskopické výkony
- ☐ bariatrická chirurgie
- ☐ abdominální výkony s horní LPT
- ☐ plicní resekční výkony
- ☐ výkony s NMB delší než 3 hod
- ☐ urgentní výkon / výkon v ÚPS
- ☐ velká krevní ztráta
- ☐ perioperační hypotermie

Podmínky podání sugammadexu:

1. Použití rocuronia nebo vecuronia
2. Monitorace hloubky nervosvalové blokády (TOF)
3. Dodržování zásad bezpečné anestezie dle doporučeného postupu ČSARIM (2017)
4. Anesteziologové bez specializované způsobilosti musí o podání sugammadexu předem informovat lékaře provádějícího odborný dozor/dohled.

Kontraindikace podání sugammadexu:

1. Sugammadex je kontraindikován u nemocných s předpokládanou pokračující pooperační UPV z jiných důvodů, než je reziduální kurarizace.
2. Alergie na sugammadex nebo Bridion
3. Těžká renální insuficience

DOPORUČENÝ POSTUP PRO POUŽITÍ SUGAMMADEXU

Klinické situace s indikovaným podáním sugammadexu:

1. Neočekávané zkrácení výkonu, kdy nelze čekat na spontánní zotavení na operačním sále či PACU/JIP (peroperačně zjištěné inoperabilní malignity, nepřesná klinická diagnóza, chirurgický zázrak apod.).
2. Nutnost hluboké/střední blokády až do konce operačního výkonu
3. Nestandardně dlouhá zotavovací fáze (s nemožností řešení stavu podáním inhibitoru cholinesterázy)
4. Vysoce rizikový pacient stran vzniku PORC (3 a více rizikových faktorů)
5. Elektrokonvulzoterapie
6. Endoskopie s nutností svalové relaxace (bronchoskopie, mikrolaryngoskopie, esofagoskopie)
7. Repozice velkých kloubů v krátké celkové anestezii se svalovou relaxací
8. Situace CICO (Can't Intubate, Can't Oxygenate) po podání rocuronia

Dávkování:

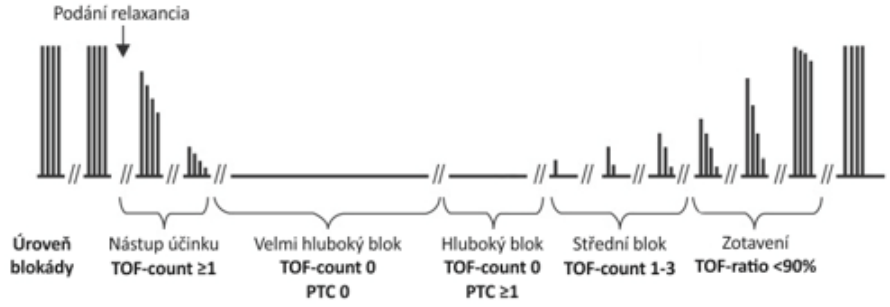
Podání sugammadexu, mimo rescue dekurarizaci při neúspěšné RSI, je vždy titrační dle TOF a s jeho cílovou hodnotou ≥90%. Nejnižší možná úvodní dávka je 4 mg/kg u velmi hluboké blokády, 2 mg/kg u hluboké blokády a 1 mg/kg u střední blokády a v zotavovací fázi.

OFF LABEL

Očekávaný efekt účinku podání sugammadexu je 2,7 min pro rocuronium a 3,5 min pro vecuronium. Pokud tedy do 4 minut není efekt sugammadexu dostatečný, podává se titračně doplňující dávka po 1 mg/kg až do požadovaného efektu TOF-ratio ≥90%. Při hodnotách TOF-ratio >45% je doplňující dávka 0,5 mg/kg.

Pro antagonizaci účinku NMB ve fázi zotavení je nutno vždy zvážit nejdříve podání syntostigminu v dávce 1 mg, sugammadex je indikován pouze při nedostatečném účinku po 15 min či u pacientů s vysokým rizikem PORC.

V případě situace CICO je dávka sugammadexu 8 mg/kg při dávce rocuronia 0,6 mg/kg nebo 16 mg/kg při dávce rocuronia 1-1,2 mg/kg.



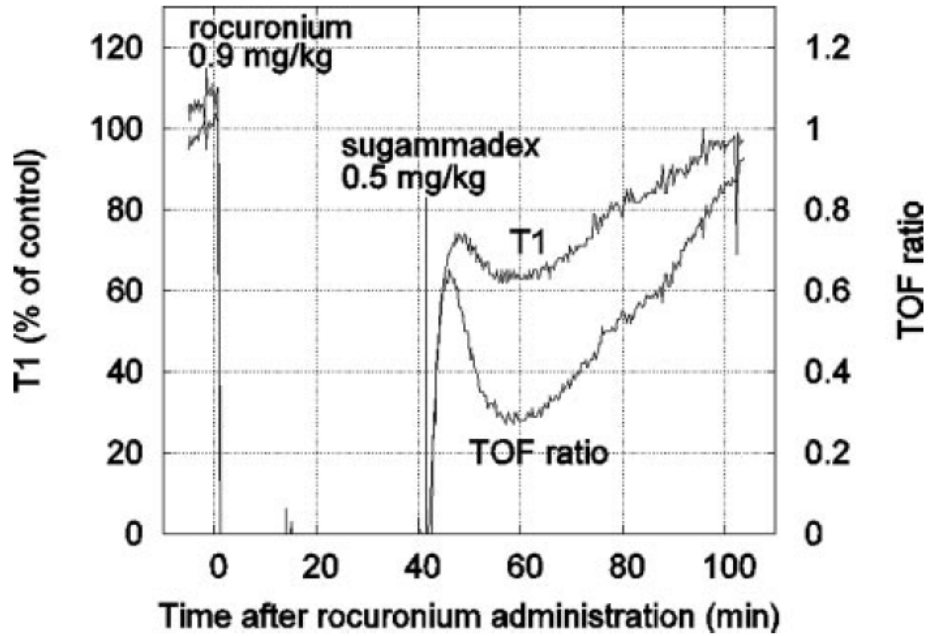


Figure 1. Temporary decrease in train-of-four (TOF) ratio and T1 during reversal of rocuronium-induced muscle relaxation (0.9 mg/kg) with sugammadex (0.5 mg/kg administered 42 min after rocuronium). At the time of sugammadex administration the posttetanic-count (PTC) value was 1.

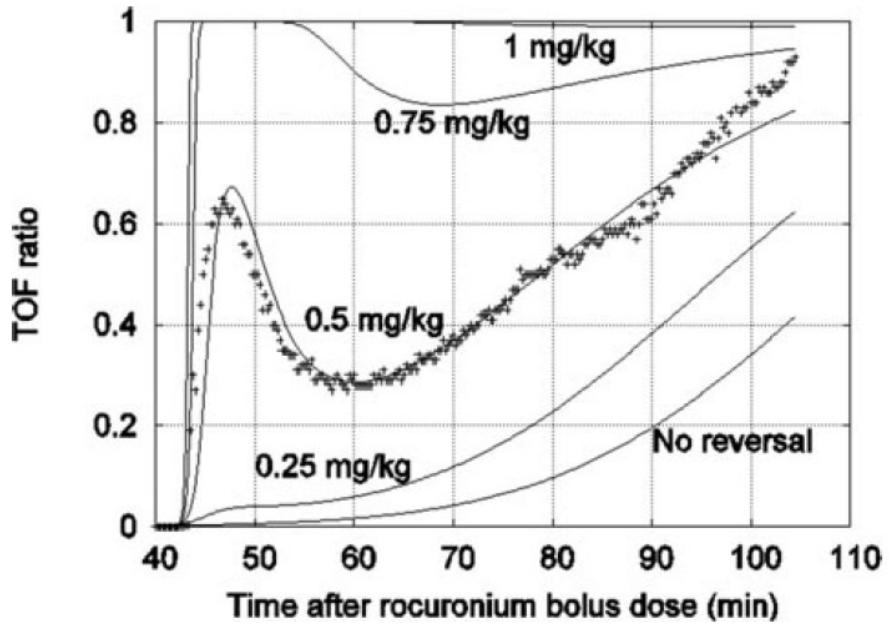
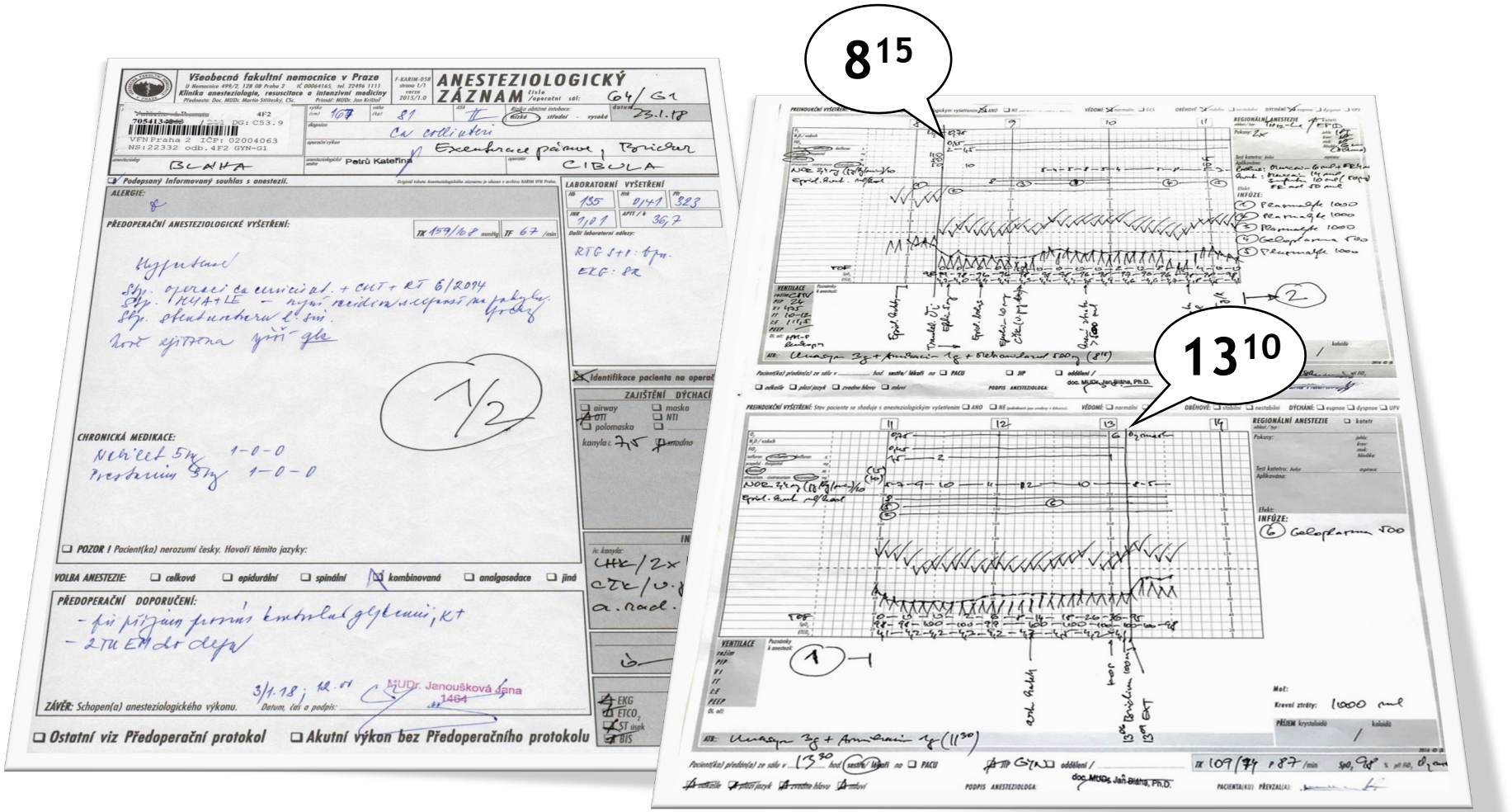


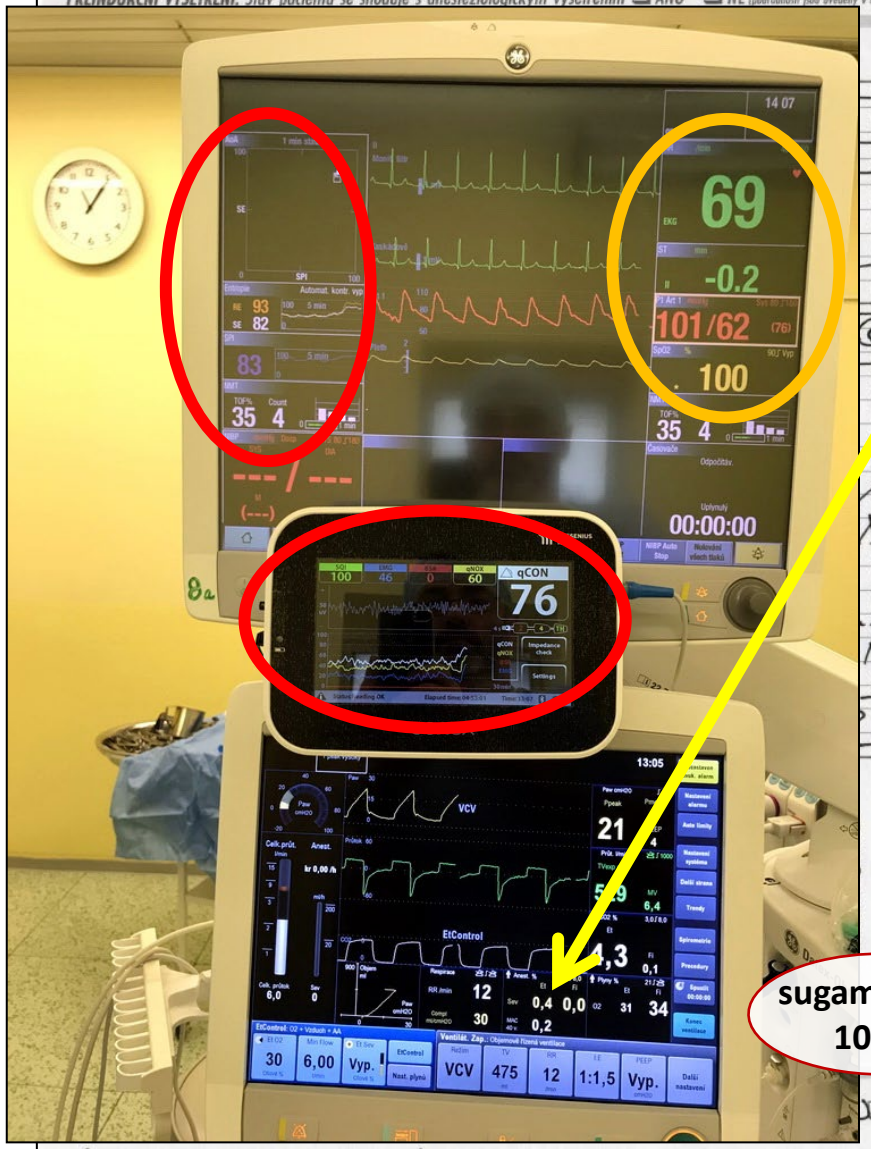
Figure 2. Observed train-of-four (TOF) data (+) and the results of simulations (solid lines) of various sugammadex dosing amounts. Muscle relaxation rebound only occurs for sugammadex doses in a limited range. The simulations indicate that for this patient, doses larger than about 1 mg/kg are sufficient to achieve rapid muscle relaxation reversal and avoid muscle relaxation rebound.

Eleveld DJ et al. Anesth Analg 2007;104:582–4

Deep block	Dose
If spontaneous recovery of the twitch response has **reached 1–2 PTCs, no twitch responses** to TOF	**4 mg/kg**

Moderate block	Dose
If spontaneous recovery has reached the **reappearance of the second twitch (T_2)** in response to TOF stimulation	**2 mg/kg**


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 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 4000 / koloidů 1000

☐ oddělení / .....

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

doc. MUDr. Jan Bláha, Ph.D.

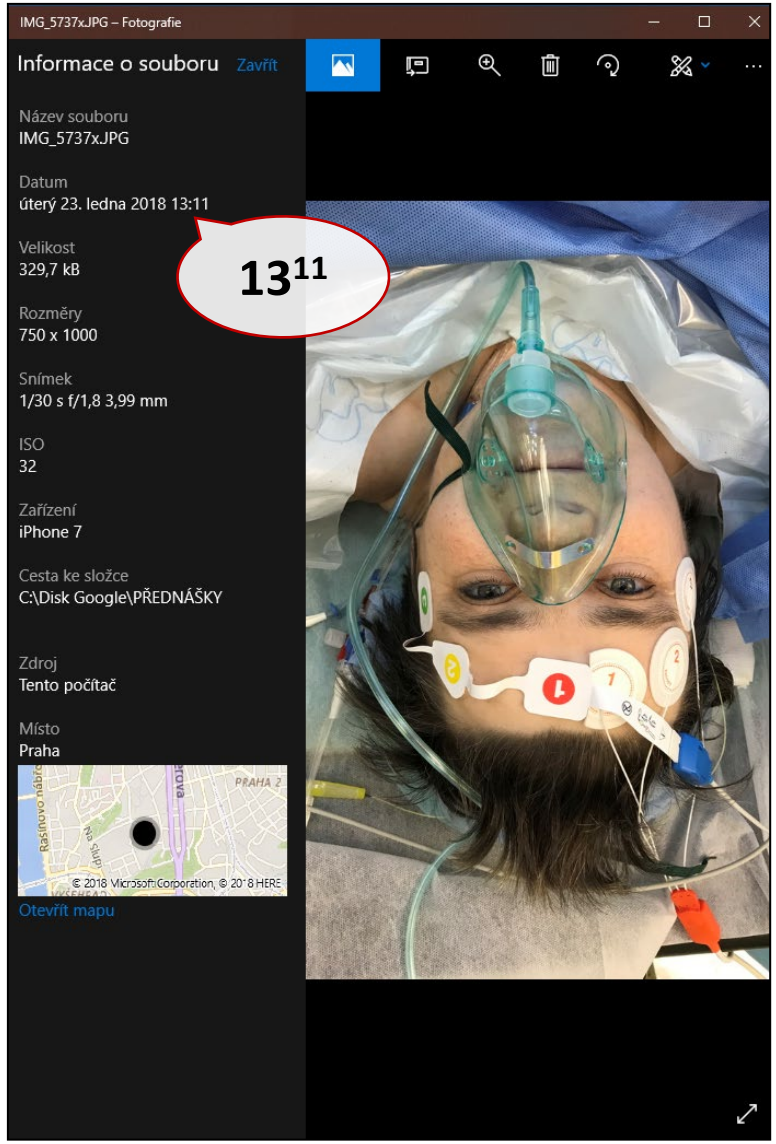
PACIENTA(KU) PŘEVZAL(A): Jana Hadravová

odkašle plazí jazyk zvedne hlavu mluví

PODPIS ANESTEZIOLOGA:


PREINDUKČNÍ VYŠETŘENÍ: Stav pacienta se shoduje s anestheziologickým vyšetřením ☐ ANO ☐ NE (podrobnosti jsou uvedeny v dekurzu).
VĚDOMÍ: ☐ normální ☐ GCS .....
OBĚHOVĚ: ☐ stabilní ☐ nestabilní
DÝCHÁNÍ: ☐ eupnoe ☐ dyspnoe ☐ UPV
13
69
-0.2
101/62
100
00:00:00
qCON
76
VCV
21
EtControl
4,3
sugammadex
100 mg
80
-0.3
102/70
100
00:00:00
qCON
89
conox
Měřítko změněno
23
301
5,1
oddělení /
doc. MUDr. Jan Bláha, Ph.D.
odkašle
plazí jazyk
zvedne hlavu
mluví
PODPIS ANESTEZIOLOGA:
PACIENTA(KU) PŘEVZAL(A):
Jana Hadravová


13^10
13^10
qCON
89
conox
EtControl
102/70
100
00:00:00
23
301
5,1
12
26
0,4
0,2
30
6,00
Vyp.
VCV
475
12
1:1,5
Vyp.


IMG_5737xJPG – Fotografie
Informace o souboru
Zavřít
Název souboru
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Velikost
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Rozměry
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Snímek
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ISO
32
Zařízení
iPhone 7
Cesta ke složce
C:\Disk Google\PŘEDNÁŠKY
Zdroj
Tento počítač
Místo
Praha
Otevřít mapu
13^11

jan.blaha@vfn.cz