



KARIM
1.LF UK A VFN V PRAZE

RSI v dnešní době ... na OS / ICU

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Klinika anesteziologie, resuscitace a intenzivní medicíny
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**VŠEOBECNÁ FAKULTNÍ
NEMOCNICE V PRAZE**



**1. LÉKAŘSKÁ
FAKULTA**
Univerzita Karlova

RSI na OS / ICU

RSI for... Boomers

> [Lancet. 1961 Aug 19;2\(7199\):404-6. doi: 10.1016/s0140-6736\(61\)92485-0.](#)

Cricoid pressure to control regurgitation of stomach contents during induction of anaesthesia

B A SELLICK

> [Anesth Analg. 1970 Jul-Aug;49\(4\):633-6.](#)

Rapid induction-intubation for prevention of gastric-content

W J Stept

„Dej tam dvě stě, sto,
podržím ti Sellicka a až
doškube obličej, tak to tam
strč...“



RSI for... GEN Z



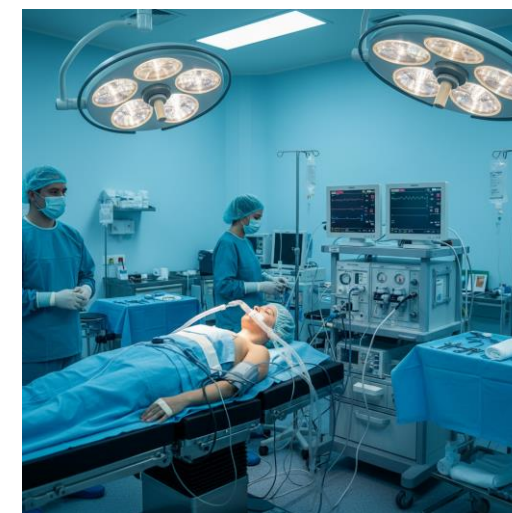
**Zabránit ASPIRACI
HYPOTENZI & HYPOXEMII**

RSI - Time line

Indikace k RSI

Preoxygenace

Medikace

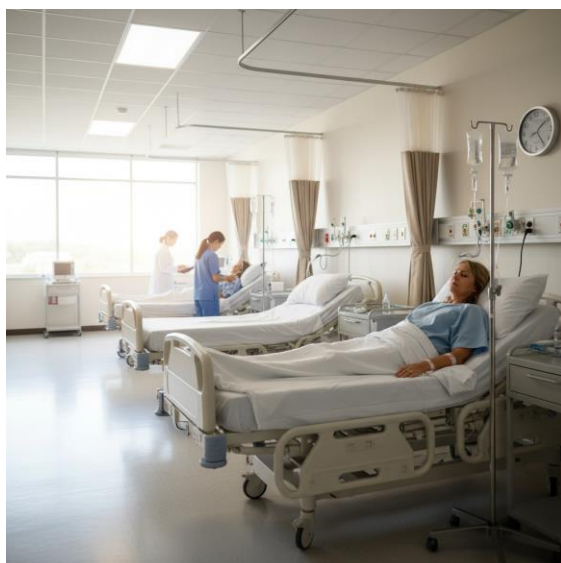


Předanest. vyš.
Příprava

Pomůcky k RSI

Poloha

Zajištění DC



**Sellickův
hmat?**



**Svalová
relaxace?**

Sellickův hmat ?

► Eur J Anaesthesiol. 2020 Mar 26;37(6):435–442. doi: [10.1097/EJA.0000000000001194](https://doi.org/10.1097/EJA.0000000000001194)

Rapid sequence induction

An international survey

[Jozef Klucka](#)¹, [Martina Kosinova](#)¹, [Kai Zacha](#)
[Roman Stoudek](#)¹, [Hana Zelinkova](#)¹, [Petr Sto](#)

- **1921 resp.**, 56 zemí
- **38,5%** Sellick vždy
- **56%** SCH

► J Clin Med. 2025 Mar 22;14(7):2177. doi: [10.3390/jcm14072177](https://doi.org/10.3390/jcm14072177)

Practices of Rapid Sequence Induction for Prevention of Aspiration—An International Declarative Survey

[Imen Ben-Naoui](#)¹, [Vincent Compère](#)¹, [Thomas Clavier](#)^{1,2}, [Emmanuel Besnier](#)^{1,2,*}

- **491 resp.**, 61 zemí
- **42%** Sellick
- **99%** anest. + SCH/ROC

Chybí konsensus odborných společností na postupu při RSI a jednotné guidelines.

017. Epub 2016 Feb 24.

induction of
survey

hi⁴

- **92%** Sellick
- **16%** JEN ROCU / 84% SCH nebo ROCU

„Sellick“ – Je na čase přestat tlačit?

> J Emerg Med. 2012 May;42(5):606-11. doi: 10.1016/j.jemermed.2011.05.014. Epub 2011 Jun 12.

Cricoid pressure provides incomplete esophageal occlusion associated with lateral deviation: a magnetic resonance imaging study

Sylvain Boet¹, Kaylene Duttchen, Jean Chan, An-Wen Chan, William Morrish, Andre Ferland, Gregory M T Hare, Aaron P Hong

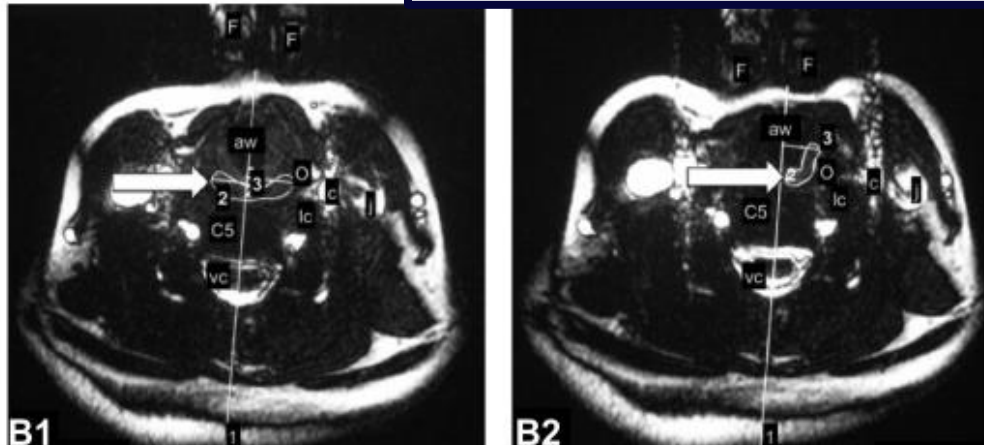
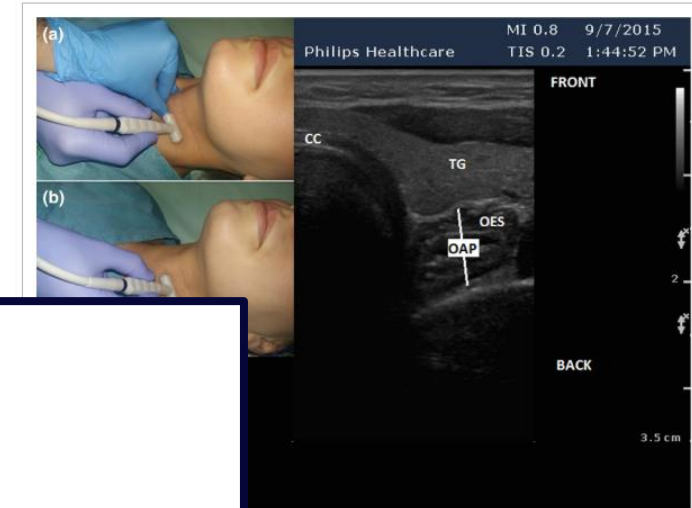
Clinical Trial > Anesthesiology. 2003 Jul;99(1):60-4. doi: 10.1097/0000542-200307000-00013.

Cricoid pressure observation imaging

Kevin J Smith¹, Jul

- 20/22 dobrovolníků
- MRI – Sellick +/-
- **70%/90,5%**

„Anatomicky to nesedí...“



- 34 dobrovolníků
- USG – AP rozměr jícnu
- **Bez statisticky významného rozdílu mezi AP rozměrem jícnu u Sellick - / Sellick +**

„Sellick“ – Je na čase přestat tlačit?

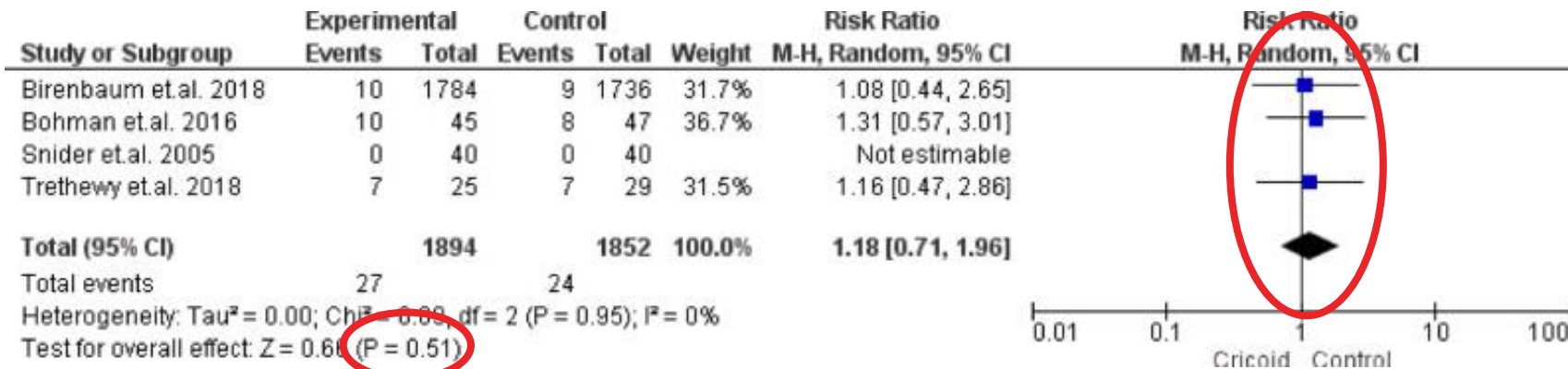
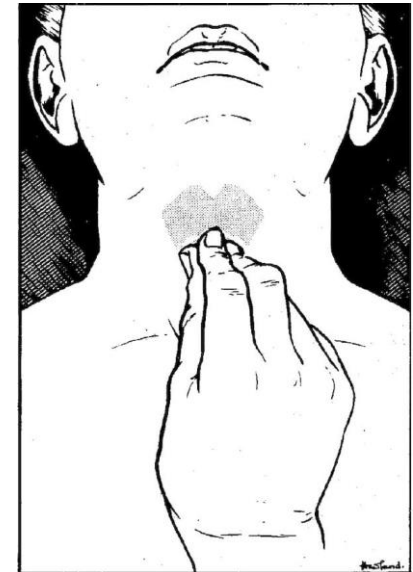
Meta-Analysis > Heart Lung. 2020 Mar-Apr;49(2):175-180. doi: 10.1016/j.hrtlng.2019.10.001.

Epub 2019 Nov 2.

Cricoid pressure during intubation: A systematic review and meta-analysis of randomised controlled trials

Leigh White¹, Christopher Thang², Anthony Hodsdon³, Thomas Melhuish⁴, Ruan Vlok⁵

12 RCTs, n = 4862



Riziko aspirace

n = 3746 pts

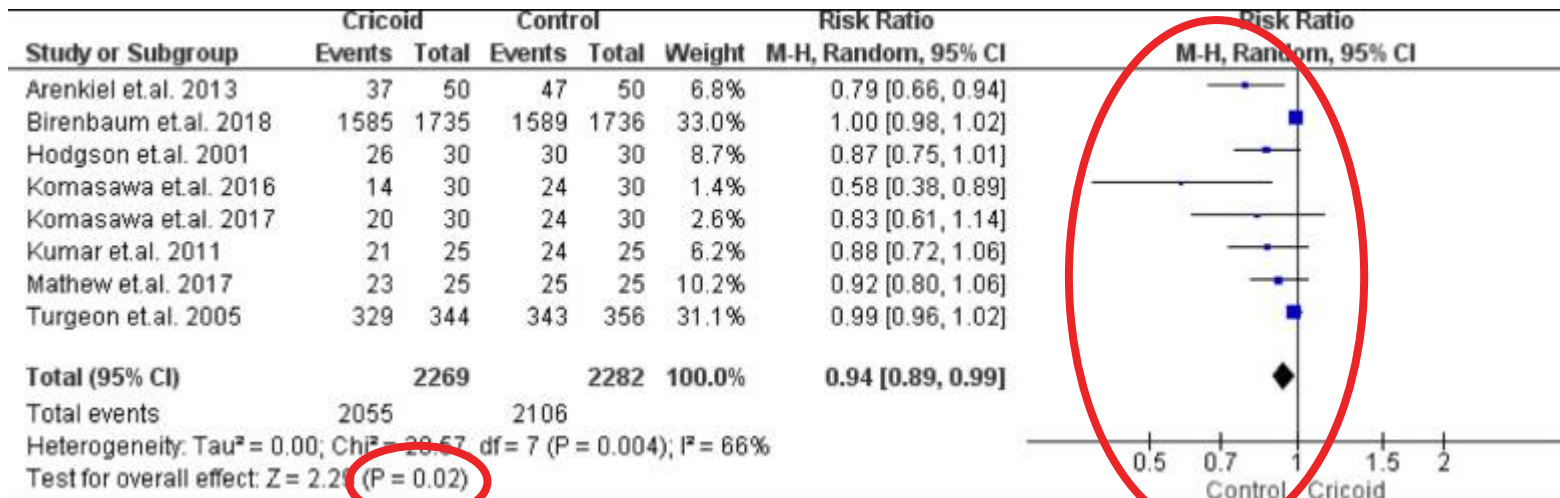
„Sellick“ – Je na čase přestat tlačit?

Meta-Analysis > Heart Lung. 2020 Mar-Apr;49(2):175-180. doi: 10.1016/j.hrtlng.2019.10.001.
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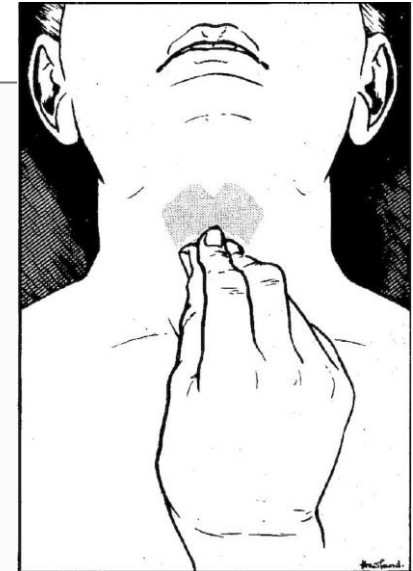


OTI prvním pokusem

n = 4551 pts

„Sellick“ – Je na čase přestat tlačit?

ANO!



- Riziko aspirace se s použitím Sellickova manévru **NESNIŽUJE!**
- Sellickův manévr **ZHORŠUJE INTUBAČNÍ PODMÍNKY,**
úspěšnost a čas OTI

Svalová relaxace k RSI

„Esme nebo Sukoš?“



Rocuronium vs. Sukcinylcholin

► Eur J Anaesthesiol. 2020 Mar 26;37(6):435–442. doi: [10.1097/EJA.0000000000001194](https://doi.org/10.1097/EJA.0000000000001194) ↗

Rapid sequence induction

An international survey

[Jozef Klucka](#)¹, [Martina Kosinova](#)¹, [Kai Zacharowski](#)¹, [Stefan De Hert](#)¹, [Milan Kratochvil](#)¹, [Michaela Toukalkova](#)¹,
[Roman Stoudek](#)¹, [Hana Zelinkova](#)¹, [Petr Stourac](#)¹

- **1921 resp.**, 56 zemí
- 38,5% Sellick vždy (37,4% nikdy)
- **56% SCH**

VFN I. Chirurgická klinika

- **Leden – srpen 2025**
- Všeobecná chirurgie (NPB) + traumatologie
- **2410 CA** z toho **138 RSI**
- SCH 27 pts vs. ROCU 111 pts
- **SCH u 19,5% RSI**

Rocuronium vs. Sukcynylcholin

časté argumenty

- **Sukcynylcholin** navodí **rychlejší svalovou relaxaci** než rocuronium
„Odezní fascikulace a můžeš intubovat...“
- **Sukcynylcholin** navodí **lepší intubační podmínky**
- **Sukcynylcholin rychleji odezní** při difficult airway



SCH je rychlejší a má lepší intubační podmínky?

Clinical Trial > Anaesthesia. 1998 Sep;53(9):867-71. doi: 10.1046/j.1365-2044.1998.00342.x.

Comparison of rocuronium and suxamethonium for use during rapid sequence induction of anaesthesia

K C McCourt¹, L Salmela, R K Mirakhur, M Carroll, M T Mäkinen, M Kansanaho, C Kerr, G J Roest, K T Olkkola

- RCT, n = 348 pts
- SCH 1 mg/kg vs. ROCU 0,6/1,0 mg/kg
- Intubační podmínky v **60s**
- **ROCU 0,6 mg/kg** – horší intubační podmínky vs. SCH
- **ROCU 1,0 mg/kg** – bez signifikantního rozdílu intubačních podmínek vs. SCH

> J Clin Anesth. 2021 Sep;72:110265. doi: 10.1016/j.jclinane.2021.110265. Epub 2021 Apr 2.

Comparison between rocuronium and succinylcholine for rapid sequence induction: A systematic review and network meta-analysis of randomized clinical trials

Clístenes Crístian de Carvalho¹, Danielle Melo da Silva², Stéphanie Leite Pessoa de Athayde Regueira³, Ana Beatriz Sá de Souza³, Caroline Oliveira Rego³, Isabella Beserra Ramos³, Jayme Marques Dos Santos Neto²

- 59 studií, 6249 pts.
- Velký rozptyl v dávkování ROCU
(0,2-1,2 mg/kg)
- Primary outcome: intubační podmínky
- **SCH 1-1,5 mg/kg vs. ROCU 1-1,2 mg/kg bez signifikantního rozdílu intubačních podmínek**

Sukcinylcholin rychleji odezní při difficult airway

SPC

- Účinek **SCH** odezní do **3-6 min** (dávka 1-1,5 mg/kg)
- Účinek **ROCU** odezní do **60 min** (dávka 1 mg/kg)

ANO! Ale...

Intubační podmínky pro **druhý, třetí... pokus?**

Sugammadex

Sugammadex



Kontraindikace, nežádoucí účinky...

KI SCH

- Hypersenzitivita
- Maligní hypertermie
- Intrakraniální ane
intrakran. HTN, f
postižením mích
- Hyperkalémie
 - St.p. trauma
popáleniná
 - Svalové atro
- Glaukom, poranění oka
- Anamnéza myotonických
onemocnění, svalové dystrofie
- Atypická aktivita plazmatické
cholinesterázy

KI ROCU

- Hypersenzitivita

NÚ SCH

- Velmi časté/časté**
- Zvýšení konc. K⁺

NÚ ROCU

- Méně časté/vzácné**
- Bolest aplikace
 - Tachykardie,
hypotenze
 - Prodloužený blok

***„Kdo si to má všechno pamatovat...
...a ověřovat.“***

- Sval. fascikulace,
myalgie
- Myoglobinemie

Svalová relaxace k RSI

– ROCU nebo SCH ?

ROCURONIUM!

- Při správné dávce (1-1,2 mg/kg) **STEJNĚ RYCHLÝ** čas nástupu
a **STEJNÉ INTUBAČNÍ PODMÍNKY**
- Delší doba účinky pro další pokusy
- Okamžitá antagonizace Sugammadexem
- Bezpečnější profil (KI, NÚ)

RSI na ICU? Jiné než na OS???

- **HYPOTENZE, HYPOSATURACE**
- **Hemodynamická stabilita?!?!? – NOR!**
- **PREOXYGENACE!!!!**
- Predikce, skorování, algoritmy – jako jinde!
- Predikované obtížné zajištění ... RAMP, **BURP**, **Video**
- Nepredikované obtížné zajištění **ILMA/BACT**
- **Praktické doporučení: Jak na to ?!?**



INTUBE study

JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

Intubation Practices and Adverse Peri-intubation Events in Critically Ill Patients From 29 Countries

Vincenzo Russotto, MD; Sheila Nainan Myatra, MD; John G. Laffey, MD, MA; Elena Tassistro, MS;

2964 from 197 sites across 5 continents were included

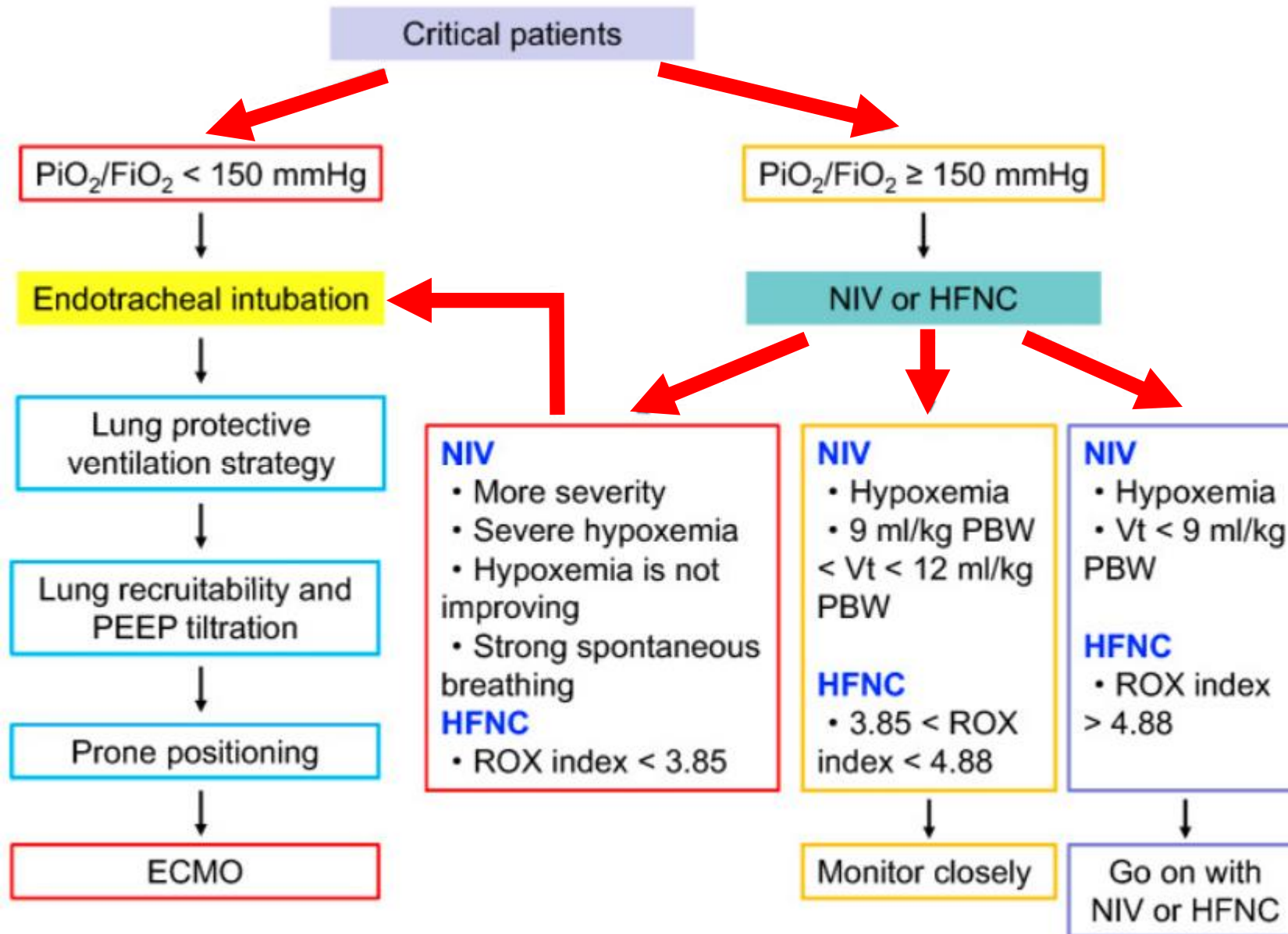
Table 2. Peri-intubation Adverse Events

Adverse events	No./Total (%)
Major adverse events (primary outcome)	1340/2964 (45.2)
Cardiovascular instability	1172/2753 (42.6)
New need or increase of vasopressors	1053/1172 (89.9)
Systolic pressure <90 mm Hg for >30 min	252/1026 (24.6)
Fluid bolus >15 mL/kg	151/1163 (13.5)
Systolic pressure <65 mm Hg	157/1163 (13.5)
Severe hypoxia (lowest SpO ₂ <80%)	272/2916 (9.3)
Cardiac arrest	93/2964 (3.1)
With return of spontaneous circulation	49/93 (52.7)
With death	44/93 (47.3)

Cause of cardiac arrest^a

Hypovolemia or hemodynamic instability	34/92 (36.9)
Hypoxia	23/92 (25.0)
Thrombosis (coronary or pulmonary)	19/92 (20.6)
Hypokalemia or hyperkalemia	3/92 (3.3)
Cardiac tamponade	3/92 (3.3)
Toxins	2/92 (2.2)
Tension pneumothorax	2/92 (2.2)
Other ^b	6/92 (6.5)

KDY???? přistoupit k OTI



Very ill patients
Statement from front-line
in Wuhan, China

Shang et al. *Ann. Intensive Care* (2020) 10:73

ROX index
SpO₂%/FiO₂/RR

HFO

Refer:

40L/min 60%

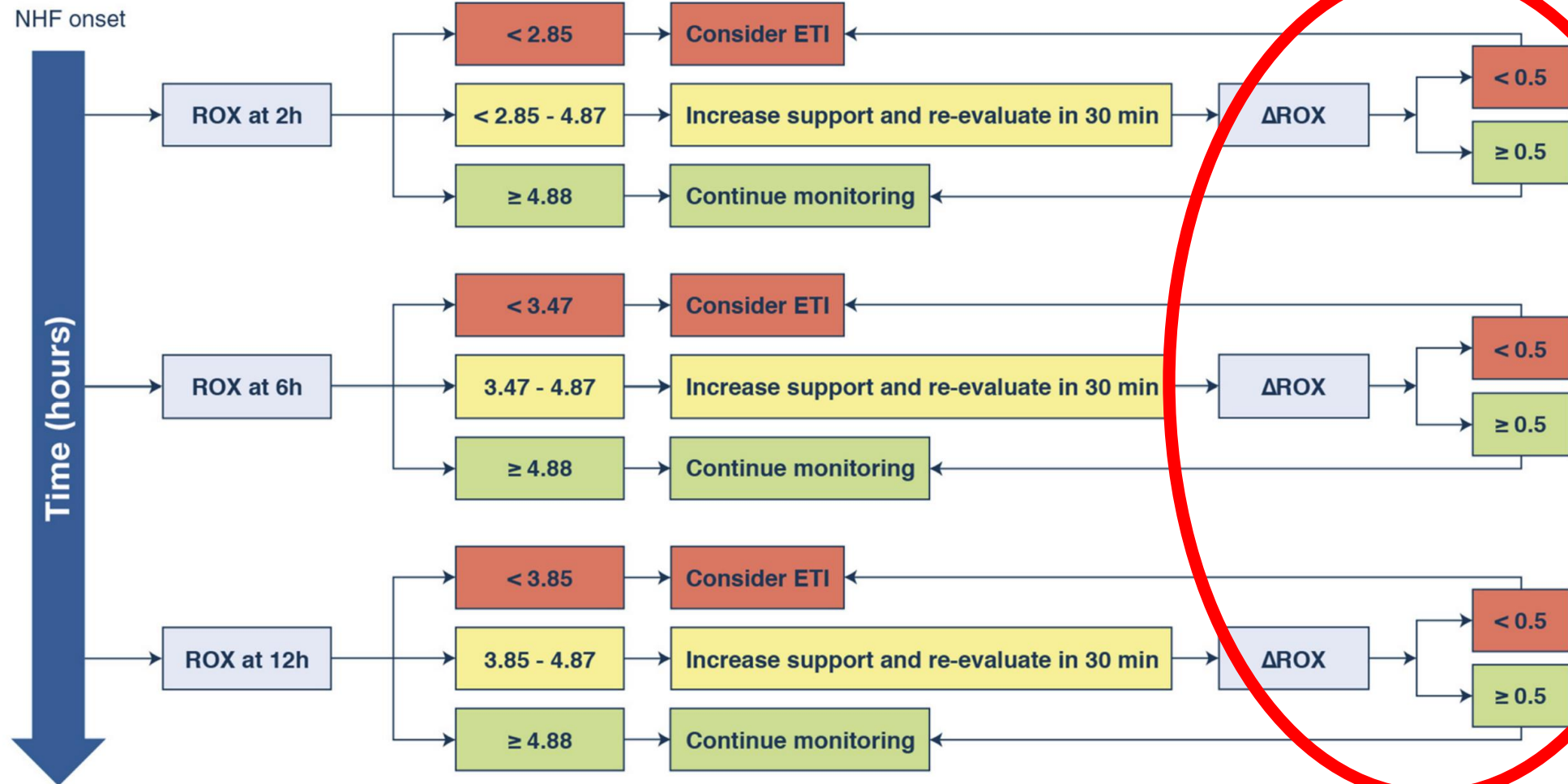
OTI:

60L/min 70-80%

HFO

Use of nasal high flow oxygen during acute respiratory failure

Jean-Damien Ricard^{1,2*}, Oriol Roca^{3,4}, Virginie Lemiale⁵, Amanda Corley^{6,7}, Jens Braunlich^{8,9}, Peter Jones^{10,11}, *Intensive Care Med (2020) 46:2238–2247*



PreOX...NIV ? HFOT...FLORALI-2

April 2016 - Jan 2017, 28 intensive care units in France

313 patients, 142 NIV / 171 to high-flow oxygen therapy

RR > 25/min, PaO₂/FiO₂ ≤300

NIV PEEP5+ PS to 6-8ml/kg, FiO₂ 1.0

v.s. HFOT 60L/min

etomidate (0.2–0.3 mg/kg) or ketamine (1.5–3 mg/kg), combined with rocuronium (0.6–1 mg/kg) or succinylcholine (1 mg/kg)

- **Severe hypoxaemia (SpO₂ < 80%)** occurred in:

NIV 33 (23%) of 142 v.s. HFOT 47 (27%) of 171 (absolute difference - 4.2%, 95% CI -13.7 to 5.5; p=0.39)



- 242 pts. (**PaO₂/FiO₂ ≤200 mm Hg**), severe hypoxaemia occurred less frequently after

NIV 28 [**24%**] of 117 patients

HFOT vs 44 [**35%**] of 125; adjusted odds ratio 0.56, 0.32 to 0.99, **p=0.0459**

THE LANCET
Respiratory Medicine

Non-invasive ventilation versus high-flow nasal cannula oxygen therapy with apnoeic oxygenation for preoxygenation before intubation of patients with acute hypoxaemic respiratory failure: a randomised, multicentre, open-label trial

Jean-Pierre Frat, MD   • Jean-Damien Ricard, PhD • Jean-Pierre Quenot, PhD • Nicolas Pichon, MD • Alexandre Demoule, PhD • Jean-Marie Forel, MD • et al. [Show all authors](#) • Published: March 18, 2019

PreOX...NIV ? HFOT...FLORALI-2

Non-invasive ventilation versus high-flow nasal cannula oxygen therapy with apnoeic oxygenation for preoxygenation before intubation of patients with acute hypoxaemic respiratory failure: a randomised,

	Severe-to-moderate hypoxemia (PaO ₂ :FiO ₂ ≤200 mm Hg)			p value	Mild hypoxemia (PaO ₂ :FiO ₂ >200 mm Hg)			p value
	NIV (n=117)	HFOT (n=125)	Absolute difference estimate (95% CI)		NIV (n=25)	HFOT (n=46)	Absolute difference Estimate (95% CI)	
Primary outcome:								
SpO ₂ < 80% during intubation procedure	28	44		0.0553	5	3		0.1197
% of patients (95% CI)	24 (16-32)	35 (27-44)	-11.3 (-22.3; 0.3)		20 (4-36)	7 (0-14)	13.4 (-2.2; 33.1)	
Adjusted on PaO ₂				0.0459				0.1003
Secondary Outcomes								
SpO ₂ at the beginning of preoxygenation, %	94±5	94±4	0.0 (-1.1; 1.1)	0.75	97±3	97±4	0.0 (-1.8; 1.8)	0.36
SpO ₂ at the end of preoxygenation,	97±4	96±6	1.0 (-0.0; 2.0)	0.02	99±3	98±4	1.0 (-0.8; 2.8)	0.31
Lowest SpO ₂ during intubation procedure, %	86±12	81±17	5.0 (1.2; 8.7)	0.02	90±15	93±8	-3.0 (-8.4; 2.4)	0.31

Propofol vs. Ketamine vs. Etomidate

Propofol, Ketamine, and Etomidate as Induction Agents for Intubation and Outcomes in Critically Ill Patients: A Retrospective Cohort Study

Chun Wan, MD, PhD,¹ Andrew C. Hanson, MS,² Phillip J. Schulte, PhD,²

Critical Care Explorations

January 01, 2012, and December 31, 2017, Mayo clinics

Internal Medicine, Pulmonary Disease and Critical Care, Internal Medicine and Critical Care, or Anesthesiology and Critical Care

2,673 patients, 36% received propofol, 30% ketamine and 34% etomidate

Primary and Secondary Outcomes According to Medication in All Patients

Outcomes	Propofol (<i>n</i> = 962)	Ketamine (<i>n</i> = 792)	Etomidate (<i>n</i> = 919)	<i>p</i>
Ventilator duration (hr), median (quartile 1, quartile 3)	35.9 (12.7–95.1)	35.6 (11.9–85.8)	40.3 (15.5–90.3) ^{b,c}	< 0.001
Hospital length of stay (d), median (quartile 1, quartile 3)	13.9 (7.3–25.5)	13.9 (6.7–27.8) ^a	11.9 (6.2–21.5)	0.003
Hospital mortality, <i>n</i> (%)	219 (23)	251 (32) ^a	297 (32) ^b	< 0.001
ICU length of stay (d), median (quartile 1, quartile 3)	4.5 (2.0–9.1)	4.2 (2.0–9.3) ^a	4.7 (2.2–9.0) ^b	< 0.001
ICU mortality, <i>n</i> (%)	125 (13)	177 (22) ^a	208 (23) ^b	< 0.001

Volumosubstituce před? PrePARE

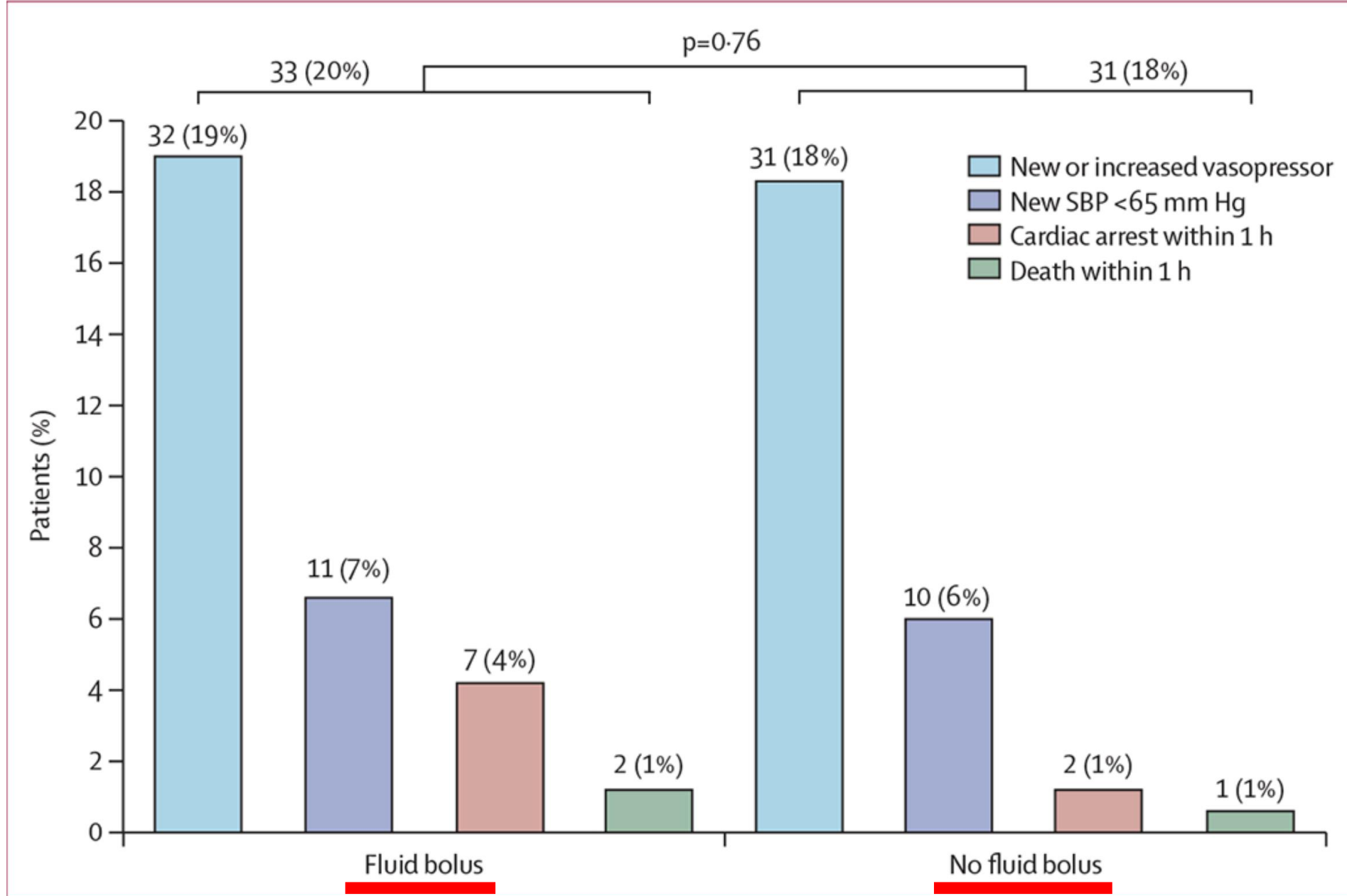
Effect of a fluid bolus on cardiovascular collapse among critically ill adults undergoing tracheal intubation (PrePARE): randomised controlled trial *Lancet Respir Med.* 2019 December ; 7(12): 1039–1047.
David R Janz, Jonathan D Casey, Matthew W Semler, Derek W Russell, James Dargin,

- Feb 6, 2017, to Jan 9, 2018, stopped the trial on the basis of futility
- six medical ICUs, one trauma ICU, one neurological ICU, and one emergency department at tertiary-care medical centres across the USA
- 337 (63%) of 537 screened adults had been randomly assigned
- **initiated intravenous administration of 500 mL of crystalloid solution before induction**

Primary Outcome: Cardiovascular collapse, defined as one or more of the following:

- **Death within 1 hour of intubation**
- **Cardiac arrest within 1 hour of intubation**
- **New systolic blood pressure < 65 mmHg between induction and 2 minutes following intubation**
- **New or increased vasopressor between induction and 2 minutes following intubation**

Volumosubstituce před? PrePARE



se among
on (PrePARE):
mber ; 7(12): 1039–1047.
ssell, James Dargin,

HYPOXEMIE PŘED???

... „TIMING“ při OTI

.... když už, tak JAK? to udělat nejlépe

Emergency tracheal intubation in 202 patients with COVID-19 in Wuhan, China: lessons learnt and international expert

BJA

Tracheal intubation with rocuronium using a "modified timing principle"

Journal of Anaesthesia, 125 (1): e28–e37 (2020)

Min A Kwon, Jaegyok Song, and Ju-Ri Kim

Korean J Anesthesiol. 2013 Mar; 64(3): 218–222.

g^{3,4,†}, Feng Gao¹, Li Wang², Hongbo Zheng¹,

Relativně vysoký počet srdečních zástav při COVID 19 intubacích ... hypoxemie a hypotenze

- **Prevence hypotenze: mít připravené katecholaminy** – minimalizace hypotenze (profylaktické podání?)
- **Prevence prohloubení hypoxemie** – RSI

Koncept „**TIMING**“ / priming podání nedepol. relaxace (rocuronium)

NEJDŘÍVE ROCURONIUM (1.2 mg kg⁻¹) potom propofol rocu (38.5)

x succinylcholine group (100.7 sec)

Jak nemít obtížnou intubaci

- RAMP, BURP

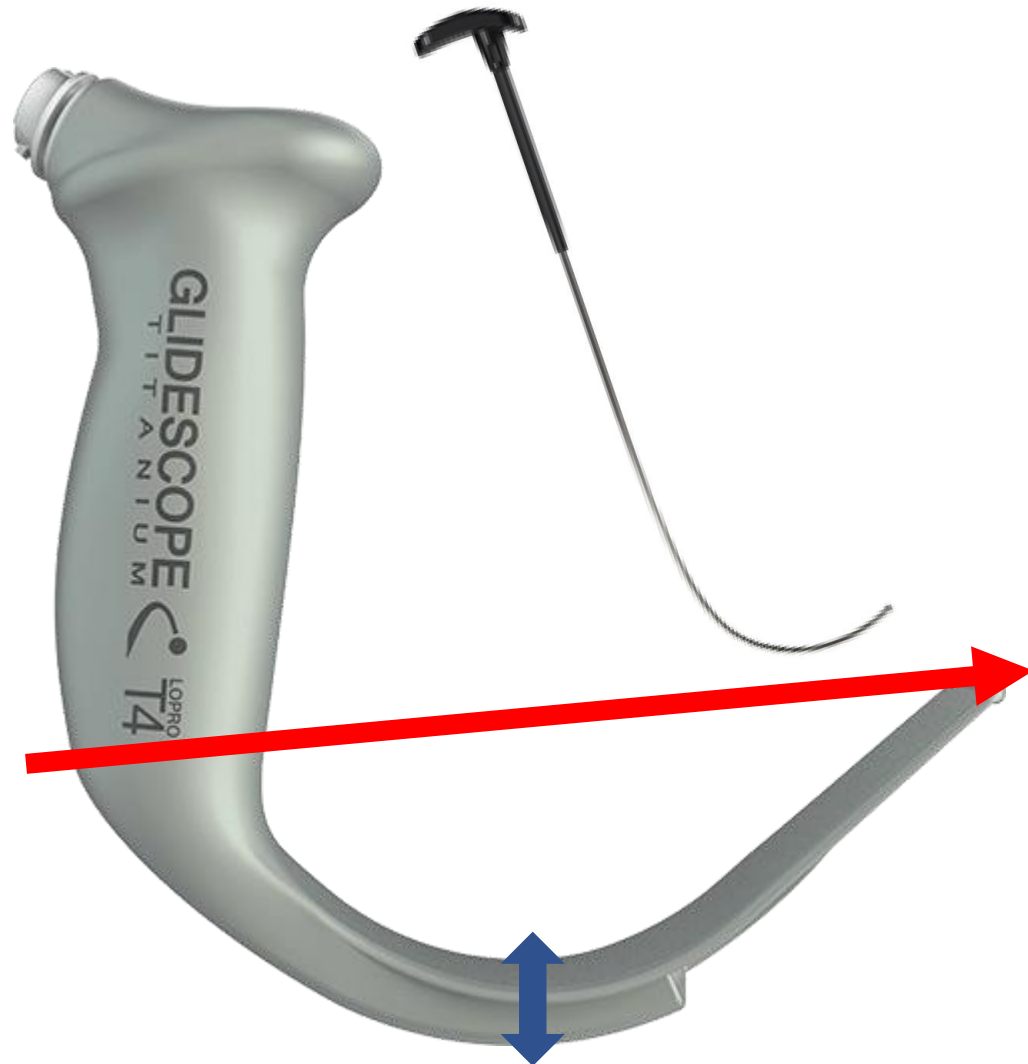


Procedures	Direct laryngoscopy	LD + mandibular advancement	LD + BURP	LD + AM *BURP
Laryngeal vision				

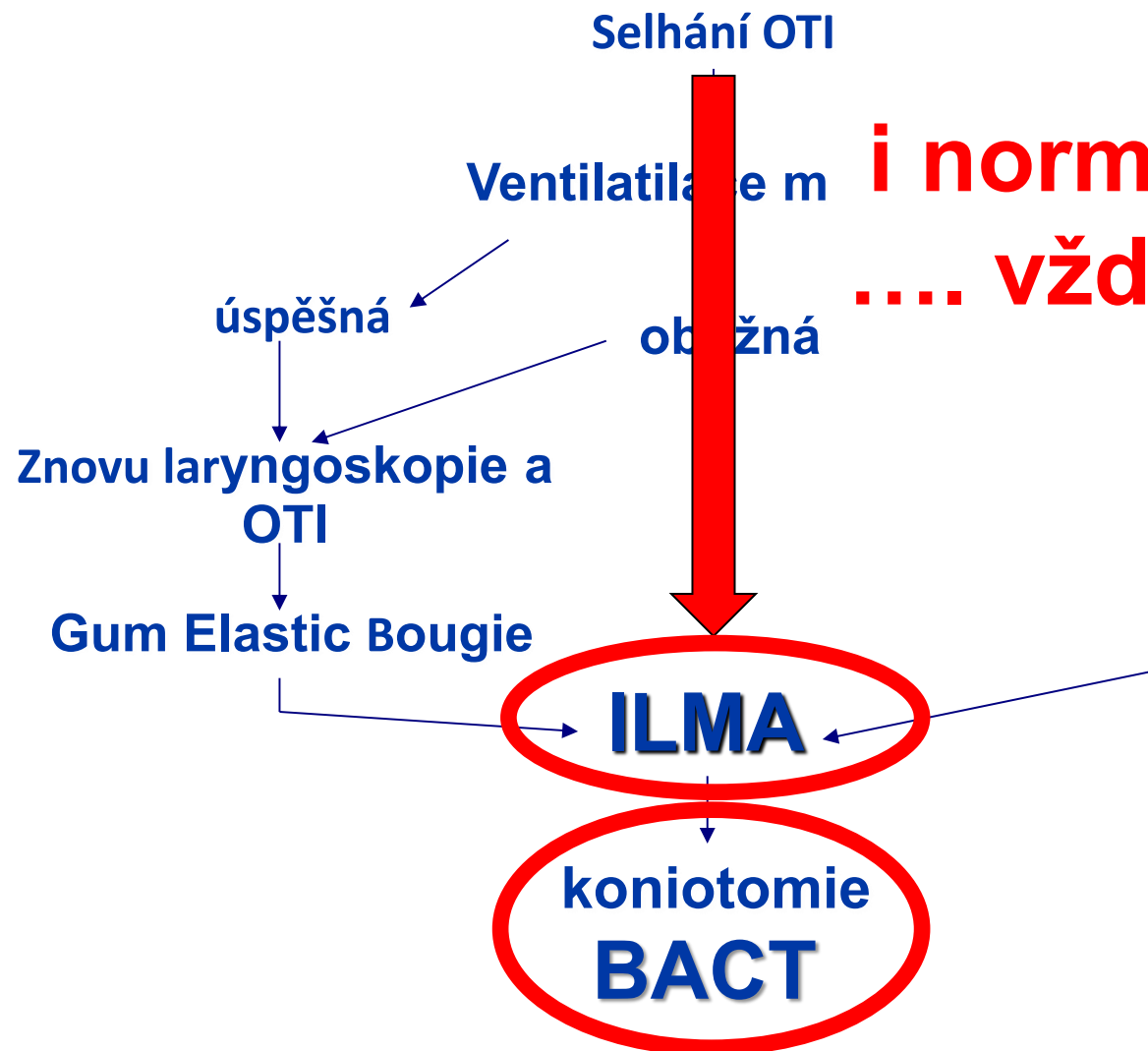
Cormack-Lehane

Backward **U**pward **R**ightward **P**ressure

Intubace Videolaryngoskopem za roh! vždy se ZAVADĚČEM



RSI na ICU/OS, algoritmy



**i normální OT kanylu při RSI
.... vždy se ZAVADĚČEM, namazaný**

+ BURP

2_{nd} SGA

FONA
Front of Neck
Airway

RSI na OS/ICU

- **Sellickův hmat – NE!**
- Relaxace volby – **ROCURONIUM**
- preoxygenace!!! **lepší NIV**
- hemodynamická nestabilita tekutiny? ... **připravený NOR!!!**
- u **hypoxemických** pacientů RSI/**TIMING** + zavaděč
- trénink ... naučit se techniky – videolaryngo
- není ČAS BURP, ILMA, ev. **BACT/FONA**